APPENDIX A

Native American Traditional Cultural Properties

State	County	Resource Name
Arizona	La Paz	Eagletail Petroglyph Site
Georgia	Putnam	Rock Eagle Site
Montana	Lewis and Clark	Eagle's Site
Nebraska	Holt	Eagle Creek Archeological Site
Oregon	Curry	Eagle Rock
Wisconsin	Grant	Eagle Valley Mound District
Wisconsin	Richland	Clipped Wing Eagle Mound
Wisconsin	Richland	Eagle Township Mound Group
Wisconsin	Richland	Hunting Eagle Mound

[a] Data are from a database search on search term >eagle= on 18 September 2007, from http://www.nps.gov/history/NR/research/index.htm.

[b] Data further refined by conducting a site-by-site, screen for potential association with sites with cultural significance associated with eagles. Information accessed on 10 October 2007, from www.nationalregisterofhistoricalplaces.com.

We consider this list to be far from comprehensive, and include it primarily to illustrate the minimal information currently available. A lack of formal listing does not lessen the need to consider a property; instead, it emphasizes the need for close coordination with appropriate parties at the project planning stage

Appendix B

Tribal Status

State Status and NatureServe Conservation Status

We recognize that the information regarding Tribal protection status is not exhaustive.

NatureServe Subnational Conservation Status Ranks
S1 - Critically imperiled in the State
S2 - Imperiled in the State
S3 - Vulnerable in the State
S4 - Apparently secure

Breeding Status Qualifiers
B - Status of Breeding Population
N - Status of Nonbreeding Population
M - Status of Migratory Population

Status Terms:
Other Protected- includes statutes specifically prohibiting take of migratory birds, eagles, and/or raptors
SOC - Species of Concern
SSC - Species of Special Concern
U -Unable to find government-specific measures

Table B.1. Tribal Status for Bald Eagles and Golden Eagles, Known as of the Date of This FEA

Tribal Status[a]		
Tribal Entity	**Bald Eagle**	**Golden Eagle**
Eastern Band of Cherokee	Other protected	Other protected
Jamestown Tribe S'Klallam	Other protected	Other protected
Mille Lacs Band of the Ojibwe	Endangered	Endangered
Navajo Nation	Endangered	Endangered
Nez Perce	Endangered	U
Oneida Nation of New York	Other protected	Other protected
Sault Ste Marie Tribe of the Chippewa	Other protected	Other protected
White Earth Band of the Chippewa	Other protected	Other protected

[a]. Information obtained online by a search of resources provided by the Tribal Court Clearing House, a project of the Tribal Law and Policy Institute.(http://www.tribal-institute.org/lists/codes.htm) and the National Tribal Justice Resource Center (http://www.tribalresourcecenter.org/tribalcourts/codes/default.asp) Data last accessed on October 10, 2007.

Table B.2. State Status and NatureServe Conservation Status Rank for Bald Eagles and Golden Eagles

State Status/NatureServe Conservation Status Rank				
State	**Bald Eagle**		**Golden Eagle**	
	Status	**NatureServe Subnational Conservation Status Rank**	**Status**	**NatureServe Subnational Conservation Status Rank**
Alabama	Other Protected	S3B	Other Protected	SNA
Alaska	No Special Status	S4B, S4N	No Special Status	S4
Arizona	Other Protected	S2S3B, S4N	Other Protected	S4
Arkansas	Other Protected	S2B, S4N	Other Protected	S3N
California	Endangered	S2	SSC Protected	S3
Colorado	Threatened	S1B, S3N	Other Protected	S3S4B, S4N
Connecticut	Endangered	S1B, S3N	U	SNA
Delaware	Endangered	S2B, S3N	U	SNA
District of Columbia	No Special	SXB, S2N	U	U
Florida	Other Protected	S3	U	SNA
Georgia	Endangered	S2	Other Protected	S1
Idaho	Endangered	S3B, S4N	No Special Status	S4B, S4N
Illinois	Threatened	S2B, S3N	Other Protected	SNA
Indiana	Endangered	S2	Other Protected	S1N
Iowa	Endangered	S3B, S3N	No Special Status	SNA
Kansas	Threatened	S1B, S4N	Other Protected	S1B
Kentucky	Endangered	S2B, S2S3N	Other Protected	SXB, S2N

State Status/NatureServe Conservation Status Rank				
State	Bald Eagle		Golden Eagle	
	Status	NatureServe Subnational Conservation Status Rank	Status	NatureServe Subnational Conservation Status Rank
Louisiana	Endangered	S3B, S2N	No Special Status	S1N
Maine	Threatened	S4B,S4N	Endangered	S1B,S1N
Maryland	Threatened	S2S3B, S3N	No Special Status	S1N
Massachusetts	Endangered	S1	Other Protected	S1N
Michigan	Other Protected	S4	Other Protected	SNRN
Minnesota	Threatened	S3B, S3N	No Special Status	SNA
Mississippi	Endangered	S1B, S2N	Other Protected	S1N
Missouri	Endangered	S3	Other Protected	SNRN
Montana	Other Protected	S3	No Special Status	S4
Nebraska	Threatened	S1	Other Protected	S3
Nevada	Threatened	S1B, S2N	Other Protected	S4
New Hampshire	Endangered	S1	Endangered	SHB
New Jersey	Endangered	S1B, S2N	No Special Status	S4N
New Mexico	Threatened	S1B, S4N	Fully Protected	S3B, S4N
New York	Threatened	S2S3B, S2N	E (extirpated)	SHB, S1N
North Carolina	Threatened	S3B, S3N	Other Protected	SXB
North Dakota	Other Protected	S1	Other Protected	S3

State Status/NatureServe Conservation Status Rank				
State	Bald Eagle		Golden Eagle	
	Status	NatureServe Subnational Conservation Status Rank	Status	NatureServe Subnational Conservation Status Rank
Ohio	Threatened	S2	Other Protected	SNA
Oklahoma	Threatened	SNR	SSC Protected	S2
Oregon	Threatened	S4B, S4N	U	S4
Pennsylvania	Endangered	S2B	U	SNA
Rhode Island	No Special Status	S1B, S1N	No Special Status	U
South Carolina	Endangered	S2	U	U
South Dakota	Threatened	S1B, S2N	U	S3S4B, S3N
Tennessee	Other Protected	S3	Threatened	S1
Texas	Threatened	S3B, S3N	Other Protected	S3B
Utah	Other Protected	S1B, S3N	Other Protected	S4
Vermont	Endangered	S1B, S2N	U	S1S2N
Virginia	Threatened	S2S3B, S3N	Other Protected	SHB, S1N
Washington	Threatened	S4B, S4N	SOC candidate	S3
West Virginia	Other Protected	S2B, S3N	Other Protected	S3N
Wisconsin	Other Protected	S4B, S2N	Other Protected	S2N
Wyoming	Other Protected	S3B, S5N	Other Protected	S3B, S3N

APPENDIX C

Methods for Determining Eagle Take Thresholds

Introduction

In general, the study of demographics looks at life events such as births, deaths, immigration, and emigration, factors that affect the size and composition of a population. The timing of these events in life history may be critical; a population with high juvenile mortality will have a very different structure from a population with high adult mortality, a factor that would be removing breeding members of a population at a higher rate. The models applied in developing the permit thresholds rely on published estimates and have been used to develop estimates regarding overall survivorship and productivity of individuals within a population.

The FEA offers here a demonstration of how such data can be applied, in order to help explain how the Service arrived at the permit thresholds. At its most basic, data from a group or groups of individuals all born in the same time period (cohort) can be used to estimate such things as age- or stage-specific mortality rates, survivorship, and basic reproductive rates. Those rates can be compared from cohort to cohort to provide an idea of annual variation within one population and variation between different populations. For example, a juvenile survival rate of 0.47 means, of 100 first-year birds, 47 survived until the end of the first year. If juvenile survival is 0.84, 84 of 100 survived. There are survival ratios for each succeeding cohort, typically calculated by using juvenile, subadult, and adult stages; in eagles, adult stage is generally assumed to be reached at the fifth year. To illustrate, we present an idealized comparison of 2 first-year cohorts from 2 eagle populations. With only the difference in juvenile survival, and subadult and adult survival of 0.89, we would have notable differences in the total of individuals remaining in this cohort of 100 young at the end of the fifth year (Tables C.1. and C.2.).

Table C.1. Cohort/Population 1
.47 Juvenile Survival Rate

Year (survival Rate)	Starting number 100
1 (.47)	47
2 (.89)	41
3 (.89)	36
4 (.89)	32
5 (.89)	28

Table C.2. Cohort/Population 2
.84 Juvenile Survival Rate

Year (survival Rate)	Starting number 100
1 (.84)	84
2 (.89)	74
3 (.89)	65
4 (.89)	57
5 (.89)	50

The following more detailed discussion relies heavily on published papers by Hunt (1998) and Millsap and Allen (2006). Terms used are defined as follows: productivity is the number of young fledged on average per nesting attempt per nest site; survival rates are the proportion of individuals surviving each year; equilibrium is the stable age structure that eventually results from a given set of productivity and survival rate values in an eagle population; nest site includes the nesting structures and surrounding foraging areas required by a pair of eagles for successful breeding.

Our overall management objective for bald and golden eagle populations is to ensure authorized actions do not result in declines in breeding populations of either species. Determining appropriate levels of take directly is not practical because important population parameters like productivity and survival fluctuate from year-to-year, and direct counts of nests and young (the typical method for estimating eagle population size and health) do not account for non-breeding eagles, which can make up as much as 30% of healthy eagle populations. For this reason, we used a demographic population model to estimate the likely impact of permitted take at different levels on eagle populations over the long-term (defined here as 100 years). In their simplest form, population models use point estimates, usually mean values, for productivity and survival rates for different age classes in an algebraic formula to estimate population size at different points in time. The calculations are relatively straightforward, with population size in year 2 being equal to population size in year 1 minus deaths plus the number of breeding pairs times annual productivity. Such models are termed deterministic models. Complex models, known as stochastic models, incorporate measures of annual variation for the population parameters, and can allow fairly precise estimates of take potential within defined confidence intervals.

In the case of eagles, we lack adequate data on population parameters and annual variation for rigorous stochastic modeling. Instead, we adopted a more conservative approach using a deterministic model to estimate the maximum number of individuals that could be taken annually under a given set of productivity and survival rate values without reducing the number of breeders in the population in the future. The critical point where take is maximized without compromising breeding population size is termed the Maximum Sustainable Yield (MSY) for the population. Because deterministic models are based on average conditions, they overestimate take potential in years with low reproduction or high mortality (and they underestimate take potential in years of high productivity or high survival). Additionally, our estimates of population parameters may be biased or imprecise. To compensate for this uncertainty, we followed the recommendation in Millsap and Allen (2006) and set take limits at no more than ½ MSY, or 5% (1% in cases where demographic data are lacking or questionable) of annual production, whichever is lower, to ensure that under all circumstances take does not approach the point where the number of breeders is reduced. This is a conservative approach that almost certainly underestimates the harvest potential of the population, and with better demographic information and systematic population monitoring higher harvest rates might be supportable. We determined MSY by running the model to population equilibrium for 100 years with incremental 1% increases in first-year mortality until we reached the point where the pool of floaters was exhausted and any further increases in mortality resulted in some nest sites being unoccupied. We determined total reduction in the number of young added to the population at this take level, and then found ½ MSY by determining the midpoint between the original total annual production estimate and that at MSY. Take thresholds at the 5% and 1% harvest rates were determined directly by multiplying the estimated number of nesting pairs by mean productivity, and then multiplying the product by 0.05 or 0.01 (Figure C.1).

In healthy eagle populations the factor with the greatest impact on population size is the number of suitable breeding sites that exist on the landscape. For some species, the availability of suitable nesting places like cliffs sets this upper limit, while for others, territorial behavior establishes the upper maximum. Regardless, the net effect is to establish an upper limit on the number of pairs that can breed in a given landscape. In healthy populations there are more adults in the population than can breed, and these excess adults are called floaters. Floaters fill vacancies at nest sites as they occur, and as such, serve to buffer populations from decline in times when productivity does not offset mortality. We incorporated this concept into our models by setting an upper limit on the number of pairs that can breed equal to the number of currently known occupied nest sites in a population. This is conservative for populations that are growing, but may overestimate harvest potential in populations where nest sites are being lost.

To check our assumption that the take thresholds established would not produce declines in the number of breeders even with expected annual variation in vital rates, we incorporated stochastic effects into our final model of take thresholds for both species. We simulated natural variation in demographic parameter rates by randomly selecting 100 values from a normal random distribution with mean equal to the parameter mean and standard deviation (SD) equal to a plausible SD for each parameter, and then running the model for 100 years using the 100 randomly generated values. For productivity, we used a SD of 0.81 for both species. This value was the observed SD in a demographic study of bald eagles in Florida (Millsap et al. 2004), and exceeded the SD for productivity from a long-term study of golden eagles in Idaho (0.35; Steenhof et al. 1997), and was therefore likely conservative in the context of this analysis. There are no studies for either species that have been ongoing long enough to generate reasonable estimates of SD for annual survival. However, in the case of the closely related Spanish imperial eagle (*A. heliaca*), the SD of annual survival was 0.02 (Ferrer and Caldron 1990). We used a SD of 0.2 (10 times that observed for the Spanish imperial eagle) for juvenile survival and 0.1 for subadult and adult survival, under the assumptions that: (1) these likely overestimated the real SD and were therefore conservative in the context of the analysis, and (2) that the SD for juvenile survival would be greater than for subadults or adults.

Types of Take and Their Impacts: We contemplated three basic types of take that might be authorized by the Service. The first is take of individual eagles, either directly (e.g., falconry take of depredating eagles or take of individual for their feathers for Native American cultural or religious use) or indirectly (e.g., powerline electrocutions or collisions with wind turbines). The second is the temporary loss of productivity by causing disturbance of breeding pairs leading to abandonment of nests, or by rending nest sites temporarily unusable (e.g., as might occur through disturbance associated with timber harvest near a nest). The third form of take is the permanent loss of a nest territory, such as might occur with a dam project that inundated a nest site and the surrounding foraging area. In all cases, we assessed the impact of take on eagle populations by determining how the action related to our objective of not allowing cumulative annual take to exceed ½ MSY, 5%, or 1% of annual production. Since these harvest metrics are in units of individual eagles, we related each form of take to the number of individuals that would be removed from the population by the permitted action. This is straightforward for take permits for individual eagles, where the number of individuals permitted to be taken can be directly subtracted from the take limit. For pairs disturbed to the point that a nesting attempt is abandoned or otherwise lost, we considered the impact to be the loss of average productivity for each site affected. Thus, for a bald eagle population with average productivity of 1.3 young fledged per active nest site, a permit authorizing disturbance of a breeding pair for one year would have the effect of removing 1.3 individuals from the subsequent year's population. For both of these forms of take, the effects are limited to the year in which the action occurs. Thus, take limits go back to their original levels each year.

In the case of the permanent loss of a nest territory, the effect is more complex. Because permanent loss of a nest site permanently reduces the number of potential breeding pairs, take of nests is inherently incompatible with our management objective of not causing declines in the breeding population. Despite this, in some cases, for example cases involving human health and safety, we anticipate needing to issue such permits. The effect of this kind of take will not be limited to the year that take initially occurs, but to all future years as well because the equilibrium population size will be permanently reduced, unless new nest territories are created that offset the loss. We determined the recurring impact of permanent loss of nest territories by running the model with incremental 1-nest site decreases in the number of suitable nesting sites, and then compared the total population size at each new population equilibrium with the original total population size at equilibrium. The permanent loss of a nest territory resulted in constant and predictable decreases in equilibrium population size ranging from 4 to 11 individuals, depending on average productivity (Figure. C.2). While this impact cannot be completely offset by modifying take levels, its effect in reducing the overall reproductive capacity of the population can be partly addressed by permanently reducing the take limit for the population by the difference in equilibrium population size caused by the action. Thus, in a bald eagle population consisting of 1,370 breeding pairs where ½ MSY is 338, the permanent loss of a nest territory reduces equilibrium population size by 8, leading to a new annual take limit of 330 individuals in future years. This take limit remains in effect unless and until population surveys show that new nest sites have become available that offset the losses.

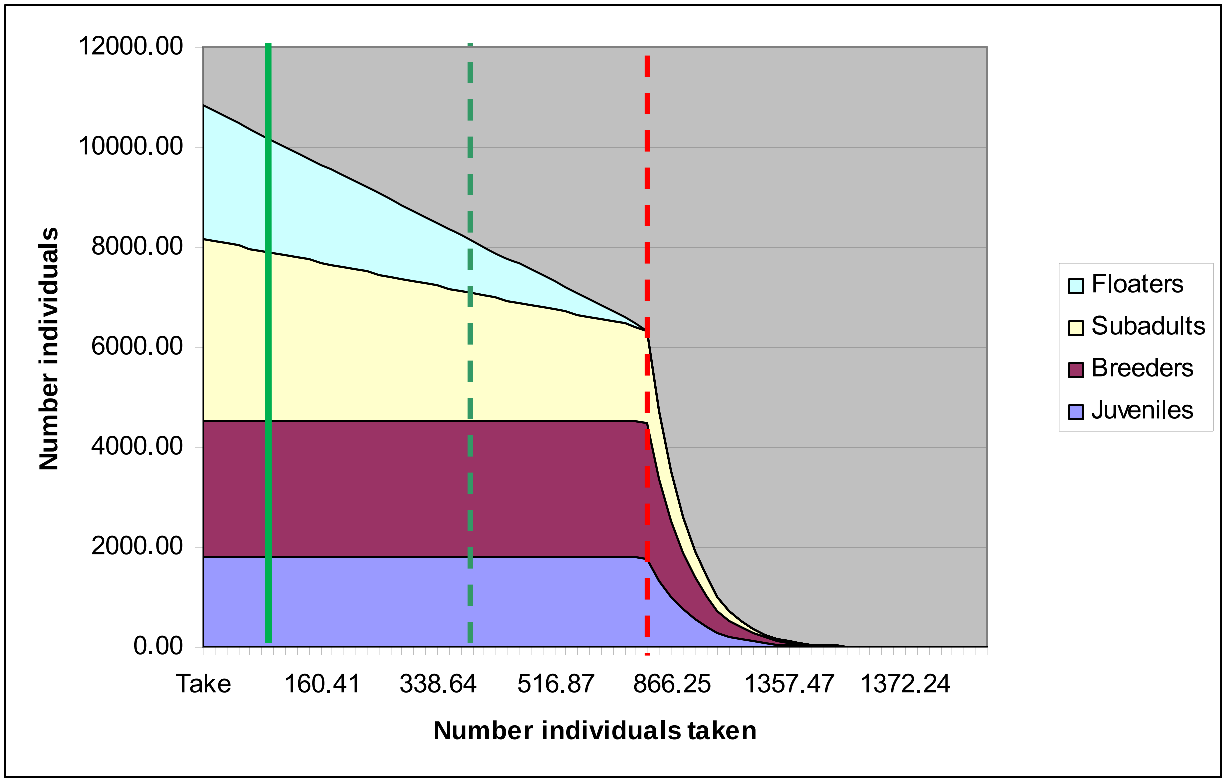

Figure C.1. Results from a series of deterministic model runs for a hypothetical **bald eagle** population under increasing levels of take. Population structure at each level of take on the X axis is the equilibrium population structure reached after 100 years at that level of take. The red dashed line indicates the point of Maximum Sustainable Yield (MSY), the green dashed line is ½ MSY, and the solid green line is a harvest rate of 5%, the proposed annual take permitting threshold for this example. Demographic values for the model are from Millsap et al. (2004): productivity = 1.3 young per nest site, juvenile survival = 0.77, subadult survival = 0.88, adult survival = 0.83, and number of nest sites = 1,371.

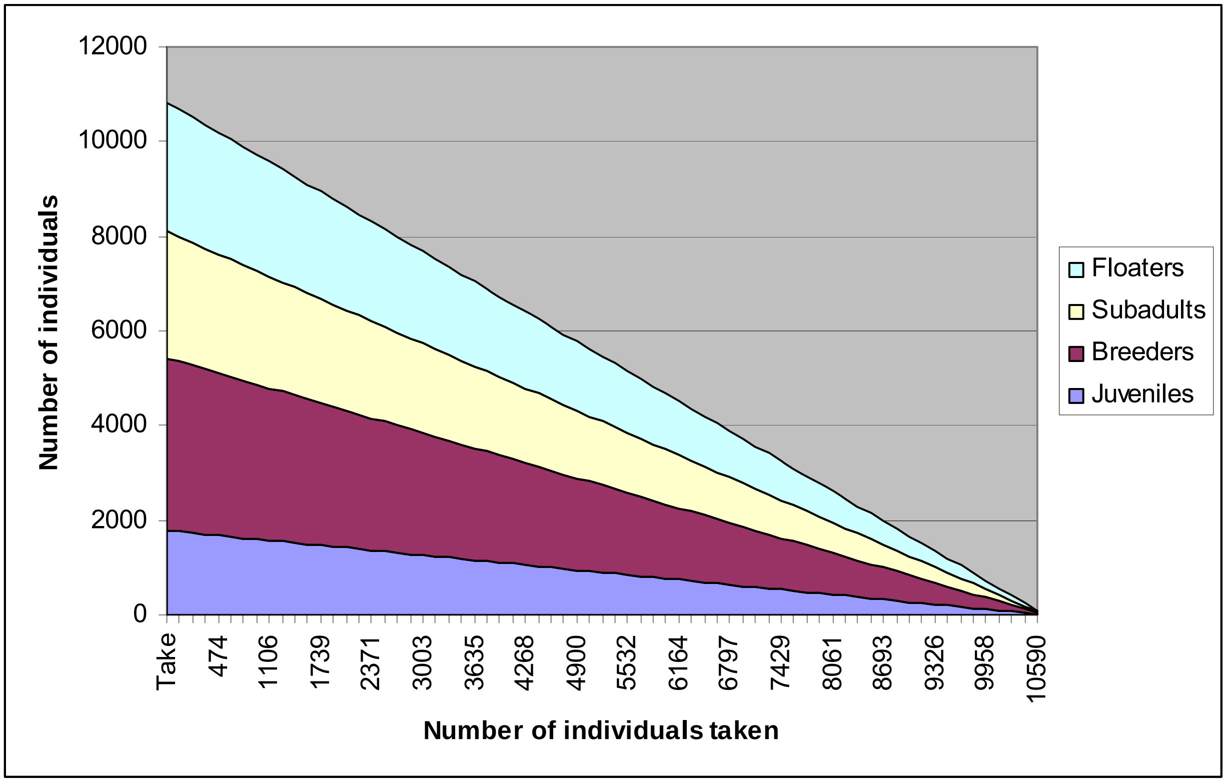

Figure C.2. Results from a series of deterministic model runs for a hypothetical **bald eagle** population under increasing levels of permanent nest territory take. Population structure at each level of take on the X axis is the equilibrium population structure reached after 100 years at that level of take. Note that there is no level of take that does not lead to a decrease in the number of breeders, hence this type of take is inherently incompatible with our stated management goal. Demographic values for the model are from Millsap et al. (2004): productivity = 1.3 young per nest site, juvenile survival = 0.77, subadult survival = 0.88, adult survival = 0.83, and number of nest sites = 1,371.

Determining Bald Eagle Take Thresholds

Derivation of Bald Eagle Regional Management Populations: We present here a brief description of the steps we took to delineate potential bald eagle regional management populations for the Eagle Act post-delisting permitting purposes. Our goal was to identify regional management populations for which take permitting thresholds would be calculated to ensure permitted take does not disproportionately negatively affect any regional management population.

1. We obtained from a variety of sources, but mainly State fish and wildlife agencies, latitude and longitude coordinates of all known recently occupied bald eagle nest sites in the lower 48 states (~15,0000 point records). This data set was used by the Service and the USGS in development of the plot-based post-delisting monitoring approach. It will also be a reference point for permitting purposes.

2. We then obtained all bald eagle band recovery records since 1937, and screened that dataset for records that were of eagles banded as nestlings that were recovered > 5 yr later during months that corresponded to egg-laying or early nestling periods for the natal "population" for the individual. We extracted from this subset of records data for the states of FL, VA, MN, AK, and AZ (n = 50), and computed the median "natal" dispersal distance (assuming that birds that met the criteria were likely breeding or in locations awaiting opportunities to breed). We then buffered the nest point data with the median natal dispersal distance (43 miles), and connected buffers around points where they overlapped.

3. We drew lines connecting gaps in the interconnected buffers to delineate potential management populations, under the presumption that, while certainly not genetically or demographically isolated, dispersal of individuals was likely greater within than between the populations given the relative distribution of nest sites (Figure C.3).

4. As a check on the hand-drawn lines, we computed fixed-kernel contours for the nationwide pooled nest point data. The contours largely supported the "eyeballed" management populations we had identified, though some management populations (such as southwest) have too few nest points to even be included in the 95% contour (Figure C.4).

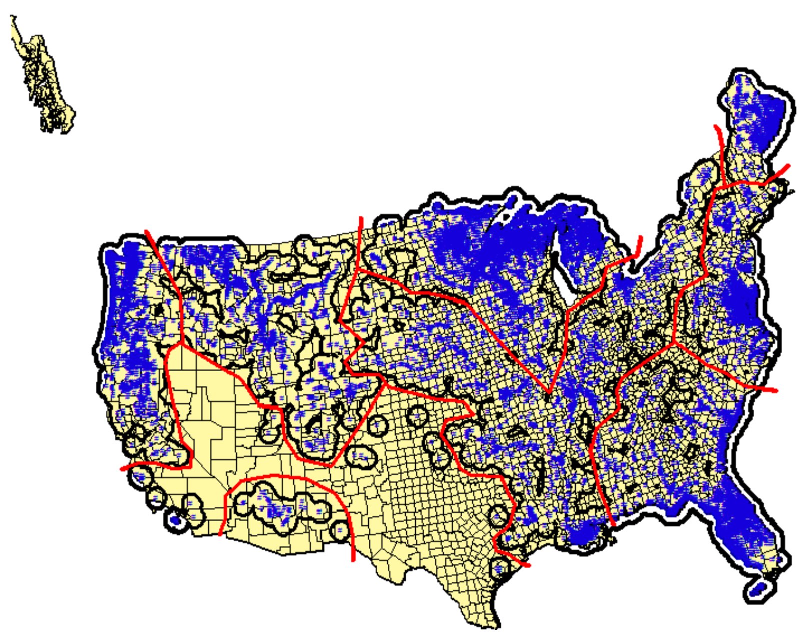

Figure C.3. Preliminary bald eagle population management boundaries (red lines)

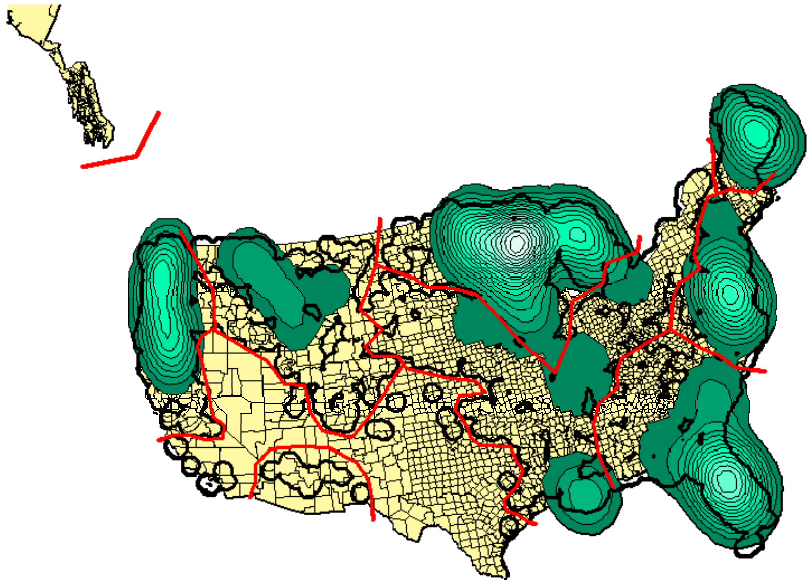

Figure C.4. Bald eagle population density and preliminary management boundaries (red lines)

5. Because the management ‘regions’ resulting from the preceding steps would have posed heightened administrative difficulties (one ‘region’ would have overlapped three separate Service Regions), we developed a proposal combining aspects of both biological and administrative boundaries (Figure C.5). One notable benefit to using Service Regional boundaries when possible is that they also correspond to State boundaries, further simplifying the coordination needs.

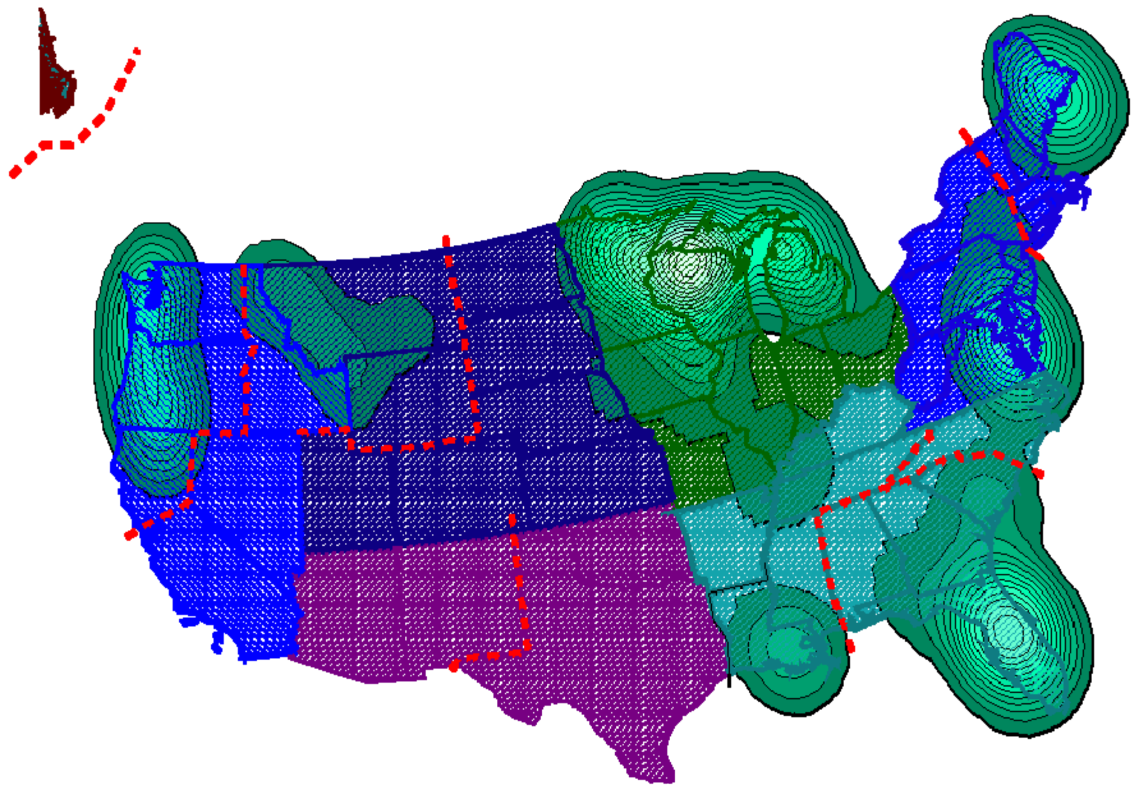

Figure C.5. Bald eagle population density analysis within proposed administration boundaries (within-Service Region population boundaries identified in red)

The red discontinuous lines in Figure C.4 shows the areas within Service Regions that we propose to treat as separate management populations. Figure C.6 reintroduces the general nest point location data as additional confirmation that the approach taken is supportable.

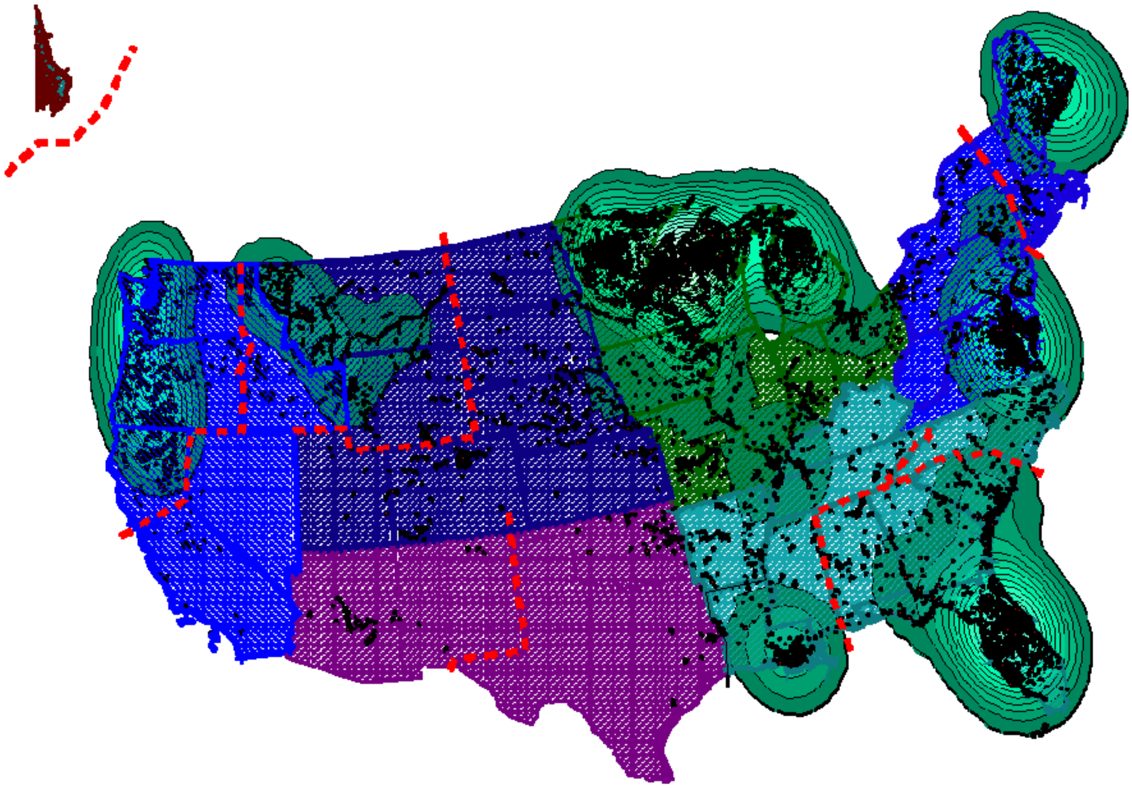

Figure C.6. Proposed general bald eagle management boundaries, relative to populations and population density analysis. States in each Service region are colored similarly and red lines denote bald eagle management population boundaries within Service regions.

Estimates of Population Size: For bald eagles, the state fish and wildlife agencies had provided the Service with locations of known nest sites, and separately, a count of occupied nest sites at the time of delisting (8,563; 72 FR 37345, July 9, 2007). These two data sets did not agree, because the dataset of mapped nests included both occupied and, in some cases, unoccupied sites. We felt it was reasonable to presume the state nest data proportionally reflect the distribution of eagles by regional management population. Accordingly, for the coterminous states, we estimated the number of occupied nest sites by multiplying the minimum number of occupied nest sites at the time of delisting by the proportion of nests in the State database in each region (Table C.3.). The Service conservatively assumed 15,000 occupied nest sites in Alaska based on partial surveys there (P. Schempf, U.S. Fish and Wildlife Service, personal communication). We adjusted these values to accommodate new or corrected information provided to us by state and tribal wildlife management agencies during the comment period on the draft EA.

For bald eagles, the Service used demographic values reported by Millsap et al. (2004) from Florida in the models for most regional management populations (annual adult survival = 83%, annual subadult survival = 88%, annual juvenile survival = 77%, number of juveniles fledged per occupied nest per year = 1.3), but we used more specific data when it was available (see citations in footnotes to Table C.3). Modeling provided us with an estimate of the number of bald eagles within each regional management population (Table C.3.).

Take of Individual Eagles: Population size estimates in Table C.3 provide a direct means of establishing annual thresholds for take of individual eagles while maintaining increasing or stable populations, assuming a direct relationship between the loss of individuals and overall population size. This approach assumes that all eagles are equal as long as population growth rates are positive, because under this condition there is a surplus of adult eagles in the population relative to the number of suitable breeding areas. We tested this assumption by running models with incremental decreases in adult (rather than juvenile) survival, and at the harvest rates contemplated we saw no difference in the effects on populations. To provide for uncertainty, and to allow for randomness not accounted for in the model, the Service followed the recommendation in Millsap and Allen (2006) and established recommended thresholds for take of bald eagles at levels of 5% of annual production, except that ½ MSY was more conservative in the case of the Southwestern management population, so ½ MSY was used in that case. The total estimated take allocated to each Service Region in Table C.3. is the total for all types of take, of individuals, disturbance of breeding pairs, disturbance of communal roosts and important foraging areas, as well as the permanent loss of nesting territories. Under the proposed management scenarios for each regional management population, the lower 90% confidence limit for lambda in the stochastic model exceeded 1.0 (Table C.5).

Permanent Loss of Nest Territories Resulting in Permanent Abandonment of Territories: As noted earlier, permanent loss of nest territories, resulting in permanent abandonment has more profound long-term effects on eagle populations than the loss of individual eagles. The Service employed the same model described above to set thresholds on the number of eagle territories that could be permanently taken each year while maintaining increasing or stable populations, again assuming conservatively that populations are at equilibrium. The Service initiated modeling with the current population size estimates in Table C.3., and then recalculated population size estimates with iterative decreases in the number of available nest sites to determine what level of territory loss would decrease in overall population size at population equilibrium. For bald eagles at current population levels, model results indicated the permanent loss of a nest site or abandonment of a territory leading to loss of a nesting pair was demographically equivalent to the loss of 5 to 11 individuals, depending on vital rates. As noted earlier, because loss of a territory confers a recurring decrease in population potential, the authorization to take a territory permanently reduces subsequent year's take thresholds by 5 to 11, depending on the management population, unless subsequent surveys show the regional bald eagle nesting population is growing.

Cumulative Effects: Recommended thresholds for take of individual bald eagles and nests are not independent of one another. To ensure overall levels of take do not exceed the recommended thresholds, the Service would consider the permitted likely permanent loss of a nest territory or abandonment of a territory resulting in the loss of a nesting pair to be the effective equivalent of the permitted take of 5 to 11 individual bald eagles from the regional management population, depending on the population. For most management populations, we used demographic data from Florida (Millsap et al. 2004), an din these cases take affecting 1 individual = 1 individual from the threshold; take resulting from disturbance at 1 nest for only 1 time = 1.3 individuals from the threshold, 1 nest take resulting in the permanent abandonment of a territory = 1.3 individuals from the threshold the first year, and a reduction in 8 individuals from the annual threshold each year thereafter until data show the number of breeding pairs has returned to the original estimated, or until it can be demonstrated that the predicted loss has not occurred.

Determining Golden Eagle Take Thresholds

Under the same basic management objective as for bald eagles (i.e., permitting take at a level that would be consistent with the goal of stable or increasing breeding populations), and using the same modeling framework (i.e., that described in Millsap and Allen 2006 as developed by Grainger Hunt), annual take thresholds for golden eagles in the western United States (excluding Alaska) are as indicated in Table C.4.

The approach used here is somewhat different than that taken for bald eagles. For golden eagles, the best available demographic data are from Hunt et al. (2002) and Kochert et al. (2002), and these data sets were used by Millsap and Allen (2006) to estimate sustainable falconry harvest. However, the Service also has recent golden eagle population size and juvenile: non-juvenile age ratio information from BCRs 9, 10, 16, and 17 from Good et al. (2008), covering a greater area extent than the data from Hunt et al. (2002). The Good et al. (2008) report suggested the average golden eagle population size for the sampled BCRs in 2003, 2006, and 2007 was 24,602, 18.6% of which were juveniles ($\leq$ 1 year old). The Good et al. (2008) report suggests golden eagle reproduction was very high in 2003. In favorable years most if not all golden eagle pairs attempt to breed (Kochert et al. 2002). We assumed this was the case in the surveyed

BCRs in 2003, and that productivity in that year was equal to the median reported in Kochert et al. (2002) (0.87 young fledged per breeding pair). Based on the number of juveniles estimated to be present in 2003 and assuming average productivity of 0.87 per pair, we estimated these BCRs support 5,800 breeding pairs. Assuming 5,800 breeding pairs, we iteratively decreased productivity values in the population model until we reached a juvenile population size that approximated the average number of juveniles estimated in the Good et al. (2008) survey for 2003, 2006, and 2007 (4,577). Using this productivity value in the model (0.79 young per breeding pair) yielded an estimated a total population size slightly higher than 24,602, so we iteratively decreased the juvenile survival rate to 0.61, at which point the total population size from the model was approximately equal to the average in Good et al. (2008). Our rationale for varying productivity and juvenile survival to balance the equation is that these vital rates are the most variable in studied golden eagle populations (Kochert et al. 2002)

This approach could be extended to include golden eagles from Alaska, and for other BCRs outside the study area covered by Good et al. (2004). However, estimates of population size in Alaska are coarse, and juvenile survival may be far lower, so management would therefore require a conservative approach. Just as the Service used the demographic parameter estimates derived from Good et al. (2008) because they covered a greater geographic extent than other information, the Service also, for the same reason, used the golden eagle population data from the Partners in Flight Landbird Populations Estimates Database, based upon the estimates in Rich et al. (2005), using BBS data. The Service recognizes the limitations of the data, and discusses them in Millsap and Allen (2006) (Appendix E), and we recognize that the data accuracy and precision vary widely. However, the population estimate of 24,602 derived for BCRs 9, 10, 16, and 17 using data from Good et al. (2008), is comparable to the population estimate of 26,265 for the same BCRs from Rich et al. (2005). In addition, there are estimates, varying in reliability, for every BCR covered in this proposal with breeding populations of golden eagles. But because there is little evidence BCRs correspond to real breaks in golden eagle distribution, and because the estimates may not exactly reflect population data from individual States, the Service will modify our approach to establishing take thresholds and allocations as better information becomes available. At this point the Service believes the proposed approach would provide the kind of regional safeguards against regional “overharvest” that would be similar to what the Service has proposed for bald eagles.

In a subsequent step, stochastic (sensitivity) analysis indicated the lower 90% confidence interval for lambda under this management scenario is greater than 1.0 (Table C.5). After we conducted the sensitivity analysis, we received data from the 2008 golden eagle surveys (Good et al., personal communication, January 14, 2009). Combining the 2008 data with that from 2003, 2006, and

2007 (Table C.6), yielded averages which, when incorporated into the model, indicated a negative population growth rate.

Because of the uncertainty in golden eagle demographic parameter estimates and population size estimates, the results of additional sensitivity analyses we conducted (Table C.5), and new information received after the sensitivity analysis suggesting the population growth rate averaged over the span of record of the WEST survey for golden eagles may be negative, the Service will initially place a cap on permitted take (following the approach recommended in Millsap and Allen 2006) at 0% estimated annual productivity for golden eagles. If, in the future, data and modeling suggest golden eagle populations can support take, we would begin to authorize take at no greater than 1% of annual productivity, unless information available at that time demonstrates that higher levels of take can be supported (again, following Millsap and Allen 2006 for species with high uncertainty). However, at this time, of those permits authorized under the new rule, we will only consider issuance of "safety emergency take" and the Programmatic Take permits for golden eagles , the latter because it offers the most immediate potential for reducing ongoing take and improving populations.

The total estimated take allocated to each Service Region in Table C.4. is the total for all types of take, of individuals, disturbance at nests, communal roosts, and important foraging areas, as well as take of nests.

Cumulative Effects: Recommended thresholds for take of individual golden eagles and nests are not independent of one another. To ensure overall levels of take do not exceed the recommended thresholds, at the point the Service determines the populations can support take, the Service would consider the permitted likely permanent loss of a nest territory resulting in the loss of a nesting pair to be the effective equivalent of the permitted take of 4.26 individual golden eagles from the regional management population. For golden eagles: take affecting 1 individual = 1 individual from the threshold; take resulting from disturbance at 1 nest for only 1 time = .79 individuals from the threshold, 1 nest take resulting in the permanent abandonment of a territory = .79 individuals from the threshold the first year, and a reduction of 4.26 individuals from the annual individual permit limit each year thereafter until data show the number of breeding pairs has returned to the original estimated, or until it can be demonstrated that the predicted loss has not occurred.

Determining Take Allocation for Life History Traits pertaining to Both Eagles

Thresholds for Take of Communal Roosts and Important Foraging Areas: The degree to which eagles might be disturbed (as defined at 50 CFR 22.3) by the loss of a communal night roost or foraging area would probably require case-by-case evaluation. Where eagles are known to be heavily dependent on a particular roost or foraging site, abandonment of the site due to human activities constitutes a disturbance. In cases where disturbance is deemed likely to occur, the most probable expression of that disturbance would be loss of the individual eagles. Recommended thresholds for take which results in a temporary loss of productivity would incorporate the total permitted disturbance of eagles at communal night roosts and important foraging areas. Determination of the amount of take incurred per location would be determined on a case-by-case basis by the Service Regions.

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Table C.3 Maximum Cumulative Take Allowable for Bald Eagles

REGION/MANAGEMENT UNIT	NUMBER MAPPED NESTS	% TOTAL MAPPED NESTS	PREDICTED NUMBER NESTING PAIRS[A]	PREDICTED TOTAL POPULATION SIZE[B]	HARVEST THRESHOLD (% ANNUAL PRODUCTION AND/OR % NESTS DISTURBED)[C]	MEAN NUMBER FLEDGED PER OCCUPIED NEST	ESTIMATED ANNUAL PRODUCTION	ANNUAL INDIVIDUAL TAKE THRESHOLD[D]	ANNUAL NESTING PAIR DISTURBANCE THRESHOLD[F]	TERRITORY:INDIVIUAL RATIO[G]	MAXIMUM CUMULATIVE TERRITORY TAKE THRESHOLD[H]
Region 1	**2,321.00**	**14.68%**	**1,019.31**	**7104.51**	**5.00%**		**1,160.11**	**58.01**	**50.97**		**8.33**
Northern Rocky Mountains	**168.00**	**1.06%**	**90.97**	**727.80**	**5.00%**	**1.30**	**118.27**	**5.91**	**4.55**	**8.00**	**0.74**
Pacific[I]	**2,153.00**	**13.62%**	**928.34**	**6376.72**	**5.00%**	**1.30**	**1,041.84**	**52.09**	**46.42**	**8.00**	**7.59**
Region 2	**187.00**	**1.18%**	**124.35**	**796.56**			**133.77**	**4.98**	**1.93**	**8.00**	**0.64**
Lower Mississippi	**136.00**	**0.86%**	**73.65**	**589.17**	**5.00%**	**1.30**	**95.74**	**4.79**	**1.68**	**8.00**	**0.60**
Southwest[J]	**51.00**	**0.32%**	**50.71**	**207.39**	**0.50%**	**0.75**	**38.03**	**0.19**	**0.25**	**4.00**	**0.05**
Region 3	**6,375.00**	**40.31%**	**3,452.17**	**27617.34**			**4,487.82**	**224.39**	**172.61**		**28.05**
Great Lakes	**6,375.00**	**40.31%**	**3,452.17**	**27617.34**	**5.00%**	**1.30**	**4,487.82**	**224.39**	**172.61**	**8.00**	**28.05**
Region 4	**3,003.00**	**18.99%**	**1,626.17**	**13110.78**			**2,120.44**	**106.02**	**81.31**		**13.16**
Lower Mississippi	**690.00**	**4.36%**	**373.65**	**2989.17**	**5.00%**	**1.30**	**485.74**	**24.29**	**18.68**	**8.00**	**3.04**
Mid Atlantic[K]	**79.00**	**0.50%**	**42.78**	**443.63**	**5.00%**	**1.45**	**62.03**	**3.10**	**2.14**	**10.37**	**0.30**
Southeast	**2,234.00**	**14.13%**	**1,209.75**	**9677.98**	**5.00%**	**1.30**	**1,572.67**	**78.63**	**60.49**	**8.00**	**9.83**
Region 5	**2,479.00**	**15.68%**	**1,512.27**	**14020.98**			**2,087.10**	**104.36**	**75.61**		**11.37**
Mid Atlantic[K]	**1,365.00**	**8.63%**	**909.02**	**9193.70**	**5.00%**	**1.30**	**1,302.79**	**65.14**	**45.45**	**9.00**	**6.47**
New England	**1,114.00**	**7.04%**	**603.25**	**4827.28**	**5.00%**	**1.30**	**784.31**	**39.22**	**30.16**	**8.00**	**4.90**
Region 6	**1,243.00**	**7.86%**	**673.10**	**5384.84**	**5.00%**		**875.04**	**43.75**	**33.66**		**5.47**
Northern Rocky Mountains	**873.00**	**5.52%**	**472.74**	**3781.95**	**5.00%**	**1.30**	**614.57**	**30.73**	**23.64**	**8.00**	**3.84**
Rocky Mountains and Plains	**370.00**	**2.34%**	**200.36**	**1602.89**	**5.00%**	**1.30**	**260.47**	**13.02**	**10.02**	**8.00**	**1.63**
Region 7[L]	**15,000.00**		**15,000.00**	**86550.00**	**5.00%**		**11,100.00**	**555.00**	**750.00**		**96.19**
Region 8	**205.00**	**1.30%**	**111.01**	**888.09**	**5.00%**	**1.30**	**144.31**	**7.22**	**5.55**	**8.00**	**0.90**
Pacific	**205.00**	**1.30%**	**111.01**	**888.09**	**5.00%**	**1.30**	**144.31**	**7.22**	**5.55**	**8.00**	**0.90**
TOTAL (less AK)	**15,813.00**		**8,563.00**	**68923.10**			**11,008.59**	**548.72**	**421.63**		**67.93**
TOTAL	**30,813.00**		**23,563.00**	**155473.10**			**22,108.59**	**1,103.72**	**1,171.63**		**164.11**

[A]Applies % distribution of mapped nests for lower 48 to total number of occupied nests, assuming a proportional relationship exists between mapped and occupied nests at the region/management units/state level. Alaska mapped number is already a large underestimate of occupied nests, so it is used as the predicted number as well.

[B]Predicted population size calculated using demographic model described in Millsap and Allen (2006). Unless otherwise specified, demographic data used come from Millsap et al. (2004) from a satellite-tagged eagle study in Florida: Adult survival = 0.83, subadult survival = 0.88, juvenile survival = 0.77, and number of young fledged per occupied territory = 1.3.

[C]Harvest threshold = 1/2 maximum sustainable yield (MSY), calculated as in Millsap and Allen (2006).

[D]1/2 estimated MSY.

[F]The maximum number of nesting pairs that can be disturbed or caused to fail annually and not exceed the individual take threshold.

[G]Given model predictions and estimated productivity, the estimated population size reduction at equilibrium resulting from the permanent loss of a nest territory.

[H]This is the maximum number of territories that can be lost without exceeding individual eagle take thresholds of the initial population. However, because loss of a territory confers a permanant decrease in population size and growth potential, this loss is not sustainable and should be managed such that the annual rate of permitting does not result in overall population decline > 0.5% per year, and cumulatively across years does not exceed the value in this column. For example in a management population where the predicted population size = 10,000 and with a territory:individual ratio of 8, the maximum number of individuals that could be permanently lost annually is 50 (10,000*0.05), thus the maximum number of territories that could be permitted to be permanently taken in 1 year is 6 (50/8 = 6.25, rounded down to 6). Note that if such a permit were issued, the individual take threshold for that management population would be reduced in each subsequent year by 48 (6*8) since the loss of a nest site is the equivalent of an annually recurring permit to take 8 individuals.

[I]Productivity for the Oregon portion of this Region/Management Unit = 0.97, based on comments provided in response to draft EA.

[J]Predicted population size calculated using the following demographic data provided by G. Beatty, USFWS: Adult survival = 0.88, subadult survival (average survival of age classes 2 - 4 years) = 0.78, juvenile survival = 0.73, number of young fledged per occupied territory = 0.75 (0.995 nestlings per territory * 0.75 survival rate through fledging). Estimated number of nesting territories is based on comments provided in response to draft EA.

[K]Predicted population size calculated using the following demographic data provided by E. Davis, USFWS: Survival rates as in footnote B, but number of young fledged per occupied territory = 1.45.

[L]Predicted population size calculated using the following demographic data provided by P. Schempf, USFWS: Adult survival = 0.88, subadult survival = 0.95, juvenile survival = 0.71, number of young fledged per occupied territory = 0.74.

Table C. 4 Maximum Cumulative Take Above Baseline Allowable for Golden Eagles

REGION/MANAGEMENT UNIT/STATE	ESTIMATED TOTAL POPULATION SIZE	PREDICTED NUMBER OF NESTING PAIRS[C]	HARVEST THRESHOLD (% ANNUAL PRODUCTION OR % NESTS DISTURBED)[C]	MEAN NUMBER FLEDGED PER OCCUPIED NEST	EStIMATED ANNUAL PRODUCTION	ANNUAL INDIVIDUAL TAKE THRESHOLD[D]	ANNUAL NESTING PAIR DISTURBANCE THRESHOLD[F]	TERRITORY:I NDIVIUAL RATIO[G]	MAXIMUM CUMULATIVE TERRITORY TAKE THRESHOLD[H]
Alaska[A]	2,400.00	588.24	0.00%	0.61	358.82	0.00	0.00	4.08	0.00
California portion of Northern Pacific Rainforest (BCR 5)[A]	108.00	26.47	0.00%	0.61	16.15	0.00	0.00	4.08	0.00
Prairie Potholes (BCR 11)[A]	1,680.00	411.76	0.00%	0.61	251.18	0.00	0.00	4.08	0.00
Sierra Nevada (BCR 15)[A]	84.00	20.59	0.00%	0.61	12.56	0.00	0.00	4.08	0.00
Shortgrass Prairie (BCR 18)[A]	1,080.00	264.71	0.00%	0.61	161.47	0.00	0.00	4.08	0.00
Coastal California (BCR 32)[A]	960.00	235.29	0.00%	0.61	143.53	0.00	0.00	4.08	0.00
Sonoran and Mojave Deserts (BCR 33)[A]	600.00	147.06	0.00%	0.61	89.71	0.00	0.00	4.08	0.00
Sierra Madre Occidental (BCR 34)[A]	360.00	88.24	0.00%	0.61	53.82	0.00	0.00	4.08	0.00
Chihuahuan Desert (BCR 35)[A]	720.00	176.47	0.00%	0.61	107.65	0.00	0.00	4.08	0.00
Great Basin (BCR 9)[B]	6,859.00	1,681.13	0.00%	0.61	1,025.49	0.00	0.00	4.08	0.00
Northern Rockies (BCR 10)[B]	6,172.00	1,512.75	0.00%	0.61	922.77	0.00	0.00	4.08	0.00
Southern Rockies and Colorado Plateau (BCR 16)[B]	3,770.00	924.02	0.00%	0.61	563.65	0.00	0.00	4.08	0.00
Badlands and Prairies (BCR 17)[B]	7,800.00	1,911.76	0.00%	0.61	1,166.18	0.00	0.00	4.08	0.00
TOTAL	**32,593.00**	**7,988.48**			**4,872.97**	**0.00**			**0.00**

[A]Population estimates derived from BBS counts taken in late spring (pre-fledging), following the approach used by Partners in Flight (Rich et al. 2004). These end-of-year estimates were converted to beginning of year estimates to conform with population estimates under footnote B by adding back in estimated annual mortality for all age-classes.

[B]Population estimates derived from aerial transect surveys conducted by Goode et al. (2007) in late summer (post-fledging).

[C]Number of nesting pairs and harvest thresholds predicted from estimated total population size using demographic model described in Millsap and Allen (2006). Demographic modeling started using parameter estimates reported in Millsap and Allen (2006). We then adjusted the parameter estimates to balance with the average of population size and adult:non-adult age ratios from golden Eagle surveys in BCRs 9, 10, 6,and 17 in 2003, 2006, and 2007 as reported in Goode et. al (2008). The final model used the following parameter estimates: adult survival = 0.91, subadult survival = 0.79, juvenile survival = 0.61, and number of young fledged per breeding pair = 0.79.

[D]1% of annual production.

[F]The maximum number of nesting pairs that can be disturbed or caused to fail annually and not exceed the individual take threshold.

[G]Given model predictions and estimated productivity, the estimated population size reduction at equilibrium resulting from the permanent loss of a nest territory.

[H]This is the maximum number of territories that can be lost without exceeding individual eagle take thresholds of the initial population. However, because loss of a territory confers a permanent decrease in population size and growth potential, this loss is not sustainable and should be managed such that the annual rate of permitting does not result in overall population decline > 0.5% per year, and cumulatively across years does not exceed the value in this column. For example in a management population where the predicted population size = 10,000 and with a territory:individual ratio of 8, the maximum number of individuals that could be permanently lost annually is 50 (10,000*0.05), thus the maximum number of territories that could be permitted to be permanently taken in 1 year is 6 (50/8 = 6.25, rounded down to 6). Note that if such a permit were issued, the individual take threshold for that management population would be reduced in each subsequent year by 48 (6*8) since the loss of a nest site is the equivalent of an annually recurring permit to take 8 individuals.

Table C.5. Results of stochastic analysis of proposed take thresholds, modeled as worse-case scenarios with all harvest of adults. Analysis was conducted prior to acquisition of data from 2008 golden eagle surveys (Good et al., personal communication, January 14, 2009).

	Productivity		Juvenile Survival		Subadult Survival		Adult Survival		Lambda		
Population	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**Lower 90% CL**	**Upper 90% CL**
Bald Eagle - Millsap et al. (2004) vital rates[A]	1.3	0.81	0.77	0.2	0.88	0.1	0.82	0.1	1.069	1.0677	1.0706
Bald Eagle - R2/Southwest[B]	0.75	0.81	0.73	0.2	0.88	0.1	0.82	0.1	1.004	1.0040	1.0041
Bald Eagle - R1/Pacific (Oregon)[A]	0.97	0.81	0.77	0.2	0.88	0.1	0.82	0.1	1.036	1.0355	1.0367
Bald Eagle - R5/Mid-Atlantic (New York)[A]	1.28	0.81	0.77	0.2	0.88	0.1	0.82	0.1	1.066	1.0648	1.0675
Bald Eagle - R5/Mid-Atlantic[A]	1.43	0.81	0.77	0.2	0.88	0.1	0.82	0.1	1.073	1.0717	1.0749
Bald Eagle - R7[A]	0.74	0.81	0.71	0.2	0.95	0.1	0.87	0.1	1.051	1.0500	1.0513
Golden Eagle[C]	0.79	0.81	0.61	0.2	0.79	0.1	0.909	0.1	1.011	1.0107	1.0113

[A]indicated harvest rate = 5% of annual production.
[B]indicated harvest rate = 1/2 MSY.

[C]indicated harvest rate = 1% of annual production. Analysis conducted prior to acquisition of data from 2008 golden eagle surveys. Subsequent analysis indicated harvest rate should initially be set at 0%.

Table C.6 Golden Eagle Population Estimates From WEST Surveys by BCR
With 90% Confidence Intervals (CI)

	2003		2006		2007		2008	
	Total	**Juveniles**	**Total**	**Juveniles**	**Total**	**Juveniles**	**Total**	**Juveniles**
BCR 9	10939 (7522-15754)	1190 (544-2605)	4209 (2889-7346)	783 (350-1498)	5765 (3860-8983)	497 (187-955)	5046 (2618-8904)	632 (4-1547)
BCR 10	4831 (2262-8580)	1286 (628-2634)	6335 (4064-10877)	1584 (791-3101)	7654 (4476-12284)	1168 (184-2360)	7475 (4180-11958)	965 (416-1705)
BCR 16	4998 (3199-7275)	498 (204-1216)	3309 (2419-5522)	517 (121-1142)	3187 (1972-5047)	0*	2022 (903-3670)	289 (2-771)**
BCR 17	6624 (4611-9207)	2072 (1296-3312)	9030 (6354-14082)	1306 (617-2555)	8128 (5575-11987)	774 (315-1367)	5783 (3332-9360)	248 (2-724)**

* No juveniles seen on BCR 16 survey so estimate of juveniles for BCR could not be calculated
** lower limit estimated via Bootstrap was 0, so lower limit set to # juveniles observed during the survey

4 BCRs Combined

Year	Estimate	Lower 90% CI	Upper 90% CI
2003	27392	21556	35369
2006	22883	18491	34245
2007	24734	19084	34516
2008	20326	12704	32500

APPENDIX D

Millsap, B.A. and G.T. Allen. 2006*. *Effects of falconry harvest on wild raptor populations in the United States: theoretical considerations and management recommendations. Wildlife Society Bulletin 34: 1392-1400.

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Effects of Falconry Harvest on Wild Raptor Populations in the United States: Theoretical Considerations and Management Recommendations

BRIAN A. MILLSAP,[1,2] *Division of Migratory Bird Management, United States Fish and Wildlife Service, Arlington, VA 22203-1610, USA*

GEORGE T. ALLEN, *Division of Migratory Bird Management, United States Fish and Wildlife Service, Arlington, VA 22203-1610, USA*

Abstract

*We used recent population data and a deterministic matrix model that accounted for important aspects of raptor population biology to evaluate the likely impact of falconry harvest (including take of different age classes) on wild raptor populations in the United States. The harvest rate at maximum sustainable yield (MSY) ranged from 0.03 to 0.41 for the species examined. At least for peregrine falcons (*Falco peregrinus*), harvest rate at MSY was greatest for nestlings and lowest for adults. The quality of demographic data for the species influenced MSY. For most species the state of current knowledge probably underestimates the capacity for allowed harvest because estimates of vital rates, particularly survival, are biased low, because emigration is not distinguished from survival. This is offset somewhat by biases that might overestimate sustainability inherent in MSY-based analyses and deterministic models. Taking these factors into consideration and recognizing the impracticality of monitoring raptor populations to determine actual effects of harvest, we recommend that falconry harvest rates for juvenile raptors in the United States not exceed one-half of the estimated MSY up to a maximum of 5%, depending on species-specific estimates of capacity to sustain harvest. Under this guideline, harvest rates of up to 5% of annual production are supported for northern goshawks (*Accipter gentilis*), Harris's hawks (*Parabuteo unicinctus*), peregrine falcons, and golden eagles (*Aquila chrysaetos*); lower harvest rates are recommended for other species until better estimates of vital rates confirm greater harvest potential.* (WILDLIFE SOCIETY BULLETIN 34(5):1392–1400; 2006)

Key words

demographics, falconry, harvest, maximum sustainable yield, modeling, raptors, United States.

Falconry has been practiced in the United States since at least the 1920s. Prior to inclusion of Falconiformes and Strigiformes under the Migratory Bird Treaty Act (MBTA) with amendment of the treaty with Mexico in 1972, falconry was not federally regulated, and no comprehensive records are available on the number of falconers or number of raptors removed from the wild annually. Regulations promulgated by the United States Fish and Wildlife Service (USFWS) in 1976 (50 CFR Part 21) formally legalized falconry under MBTA and necessitated that the USFWS assess the likely impacts of falconry harvest on wild raptor populations. Those regulations required falconers to be permitted and to report the harvest and subsequent disposition of raptors acquired for use in the sport. The requirements resulted in data useful in assessing the likely impacts of falconry on wild raptor populations, and the USFWS used those data to conduct its first environmental assessment of falconry in 1988 (United States Department of the Interior 1988). The 1988 environmental assessment concluded that the impact of falconry on wild raptor populations in the United States was inconsequential.

Since 1988 2 important things have changed. First, the American peregrine falcon (*Falco peregrinus anatum*) was removed from the federal list of endangered and threatened wildlife in 1999. The subspecies had been protected from falconry harvest since federal regulation of the sport began because of its listed status. Subsequent to delisting, a conservative and carefully controlled harvest was allowed in the western United States (USFWS 2004). This action prompted a legal challenge to the USFWS's assertion that falconry harvest of American peregrine falcons will have minimal impacts on the wild population and the allegation that the USFWS's failure to adequately monitor peregrine populations to determine the impact of harvest violates the MBTA (Audubon Society of Portland et al. vs. United States Fish and Wildlife Service 2004). Second, the federal government has adopted more stringent standards for information for making science-based decisions. The standard requires clearer articulation and more scientific peer review of the information used in such determinations (Office of Management and Budget 2004).

Several aspects of raptor population biology are particularly germane to an assessment of impacts of falconry harvest. In addition to the overall limiting effect of prey availability, nesting densities of healthy wild raptor populations usually are further constrained by the availability of suitable nesting sites, spatial restrictions imposed by territoriality, or both (Newton 1979, Hunt 1998). The net effect is that an upper limit exists on the number of adult individuals that can breed in a given landscape. This, in turn, may result in a large number of nonbreeding adults awaiting opportunities to occupy vacancies at breeding territories (Newton 1988, Hunt 1998). These "floating" adults are not accounted for by conventional counts of

[1] *E-mail: Brian_A_Millsap@fws.gov*

[2] *Present address: New Mexico State Administrator, United States Fish and Wildlife Service, Albuquerque, NM 87102, USA*

territorial pairs or nestlings (Newton 1988), yet they can profoundly affect populations by buffering the effects of population declines, by contributing to decreases in reproductive success of breeders directly through interference competition and direct mortality (Tordoff and Redig 1997), and, perhaps indirectly, through competition for food resources (Newton 1988). Further, as a consequence of intense competition for nesting territories, age at first breeding is increased in healthy raptor populations, presumably because younger adults face competition with established or experienced older birds for vacancies at breeding sites.

This paper describes the likely impact of falconry harvest on wild raptor populations in the United States. We use the USFWS's most recent data on numbers of raptors taken from the wild and employ deterministic models to assess estimated effects on populations. We also illustrate how the dynamics of most raptor populations make monitoring the short-term impact of falconry harvest on populations in the wild nearly impossible and certainly impractical, and we make recommendations on how this should be accounted for in harvest strategies.

Methods

Definitions

We use the term juvenile to refer to an individual <1 year old, subadult to refer to a raptor >1 year of age but typically not old enough to breed, and floater to refer to an adult that has not settled into a breeding slot at an established nesting site. Falconry harvest typically focuses on juvenile raptors, either nestlings (eyases) or fledged young <1 year old (passagers). "Harvest" and "take" in this paper refer to the capture and removal from the wild of raptors for use in falconry. Harvest rate is the difference between the annual survival rate of the harvested age class without harvest and with harvest; in the case of eyas and passage age classes, this equals the proportion of the annual cohort of young harvested by falconers. The maximum sustainable yield (MSY) is the greatest harvest rate (in 0.01-unit increments) that does not produce a decline in the number of breeding adults in the modeled populations; we refer to harvest levels below this rate as sustainable. Moffat's equilibrium is the stable age structure at equilibrium population size for a given set of demographic parameter values (Hunt 1998). When we report population size at Moffat's equilibrium, we include all age classes, unless otherwise noted. Demographic parameters of interest are productivity, defined as mean number of young fledged per occupied nest site annually (ρ) as recommended by Steenhof (1987), and the juvenile (θ_j), subadult (θ_s), and adult (θ_a) annual survival rates (proportions alive at fledging time each year).

Falconry Harvest

Falconers who take raptors from the wild generally are required to do so either by removing eyases from nests or by trapping passage birds during their first year of life. Because of difficulties distinguishing age classes, current regulations do not restrict harvest of American kestrels (*Falco sparverius*) and great horned owls (*Bubo virginianus*) to first-year individuals. In addition, golden eagles (*Aquila chrysaetos*) older than one year may be taken, but all harvest of golden eagles is restricted to depredating individuals under special circumstances by provisions in the Bald and Golden Eagle Protection Act (16 U.S.C. 668–668d). Each falconer must report to the USFWS and the respective state fish and wildlife agency all acquisitions and dispositions of raptors taken or otherwise acquired under his or her falconry permit (50 CFR 21). United States Fish and Wildlife Service regional migratory bird permit offices input all data on raptors taken from the wild into the USFWS's permit-tracking database. We used data for 2003 and 2004 from this database to assess the number of raptors removed from the wild by species for the purposes of our analyses. Some wild take may go unreported each year, but we believe such actions are infrequent enough to be considered inconsequential in the context of this analysis.

We used the harvest statistics reported above and modified population size estimates for continental North America from the Partners in Flight North American Landbird Conservation Plan (Rich et al. 2004) to estimate the proportion of the year-1 cohort removed from the wild by falconers in 2003 and 2004. These estimates are for Canada and the United States, which is the appropriate geographic scale for this assessment because migrant raptors from Canada are undoubtedly included in the United States harvest of passage raptors. We eliminated the ad hoc visibility correction factor employed by Rich et al. (2004) that doubled population estimates derived from breeding bird survey (BBS) counts under the general assumption that 50% of individuals were not detected because they were incubating or brooding on nests. This assumption likely is not valid for raptors because most species have large young that do not require brooding by the time BBS routes are run in May and June, and delayed maturation and nest-site limitations result in large numbers of subadult and floaters in most populations (Newton 1979). We agree that the probability of detection for raptors is certainly <1.0 on BBS routes but, in the absence of an empirically derived visibility correction factor, we chose to use the more conservative unadjusted estimates of population size. For the peregrine falcon, opportunities for falconry harvest currently are restricted to a portion of the species' North American range. Accordingly, we used population estimates for the peregrine falcon for the portion of the species' geographic range that is subject to harvest from USFWS (2004).

Demographic Effects of Harvest

We modeled the effects of falconry harvest at different rates on hypothetical closed raptor populations using the best demographic data from contemporary periods (1971–2002) available for each species. We gave preference to findings from long-term mark–recapture or radiotracking studies where emigration probabilities were estimated because such studies yield less biased estimates of juvenile and adult survival rates than simple band recovery or mark–recapture analyses (Kenward et al. 2000). For species lacking intensive

Table 1. Species, data sources, and demographic input to models used to assess effects of falconry harvest on wild raptor populations in the United States. All original data used are from contemporary time periods (1971–2002); specific dates of individual studies can be found by consulting the referenced papers.

Species	Data source	Geographic locale	Annual juvenile survival	Annual subadult survival[a]	Annual adult survival	No. young per occupied nest site	Age at first breeding (yr of age of limiting sex)	Max. age[b]
Eurasian sparrowhawk	Newton 1986	Southern Scotland	0.45		0.61	2.30	1	13
Northern goshawk	Kenward et al. 1999	Baltic Islands, Sweden	0.58	0.65	0.81	1.45	2	17
Harris's hawk	Bednarz 1995	Composite USA	0.70	0.64	0.82	2.10	2	17
Red-tailed hawk	Preston and Beane 1993	Composite USA	0.46	0.80	0.80	1.40	2	17
American kestrel	Smallwood and Bird 2002	Composite USA	0.31		0.55	3.30	1	11
Peregrine falcon	Craig et al. 2004	Colorado, USA	0.54	0.67	0.80	1.66	2	17
Prairie falcon	Steenhof 1998	Composite USA	0.25		0.75	2.78	1	14
Golden eagle	Survival rates from Hunt (2002), productivity from Kochert et al. 2002	California, USA for survival; composite USA for productivity	0.84	0.90	0.91	0.80	5	25

[a] For species indicated as breeding at 1 year of age, there is no subadult age class in the models. For others, the subadult age class includes years after year 1 (juvenile) and the age at first breeding. Most species indicated as first breeding at age 2 do occasionally breed at age 1, particularly females (Newton 1979), but we used the values reported here in our models as we felt they were appropriately conservative.
[b] Maximum age as calculated in models. We assumed no breeding senescence, so maximum breeding age equals maximum age.

long-term demographic studies that accounted for emigration rates, we used the midpoints of ranges for estimates of demographic parameters reported in applicable Birds of North America accounts.

We selected the following species for analysis because they are harvested regularly by United States falconers or they are biologically similar to harvested United States species: 1) Eurasian sparrowhawk (*Accipiter nisus*), biologically similar to the Cooper's hawk (*A. cooperii*) and sharp-shinned hawk (*A. striatus*), using data from a marked population in Southern Scotland from 1971 to 1984 (Newton 1986); 2) a radiotagged and banded population of northern goshawks (*A. gentilis*) from the Baltic island of Gotland, Sweden, using demographic data from 1980 to 1987 (Kenward et al. 1999); 3) Harris's hawk (*Parabuteo unicinctus*) using summarized demographic data from Bednarz (1995); 4) red-tailed hawk (*Buteo jamaicensis*) using summarized demographic data in Preston and Beane (1993); 5) American kestrel using summarized demographic data in Smallwood and Bird (2002); 6) peregrine falcon using demographic data from a color-marked population in Colorado, USA, collected from 1973 to 2001 (Craig et al. 2004); 7) prairie falcon (*F. mexicanus*) using summarized demographic data in Steenhof (1998); and 8) golden eagle using age-specific survival-rate estimates from a long-term radiotracking study in California by Hunt (2002) and composite productivity values from Kochert et al. (2002; Table 1). It is important to note that there are differences among species in how occupied nest sites were defined. In the case of the Eurasian sparrowhawk, occupied nests were defined as nests in which $\geq$1 egg was laid (Newton 1986). For other species, occupied nest sites were sites with a territorial pair in attendance, but the likelihood of detecting pairs whose nests fail early in the nesting cycle varies among species (Steenhof 1987). These differences affect strict comparability of productivity estimates among species, but we believe the bias does not compromise our overall conclusions.

To estimate how falconry harvest likely affects raptor populations, we used a deterministic, Excel-based matrix model (Hunt 2003) that limited the number of adults that could breed annually to 2,000 (i.e., we assumed 1,000 suitable breeding sites for each hypothetical population). The algebraic formulas used to compute equilibrium stage structure are given in Hunt (1998). Models were run for 100 years using point estimates of mean values for ρ, θ_j , θ_s (for species with delayed maturation), and θ_a from the peer-reviewed literature for the 8 species of raptors. We used the model output to estimate population size and structure at Moffat's equilibrium. We fixed parameters of the model that, in reality, likely would shift to buffer declines (e.g., a decrease in age at first breeding, an increase in mean productivity as nest sites of lesser quality became unoccupied and interference competition relaxed; Newton and Mearns 1988, Ferrer and Donazar 1996). However, we also made no effort to account for demographic or environmental stochasticity, nor did we account for potential lowered reproductive success of first-time breeders (Newton 1979), both factors that could affect population structure and growth rates. We recognize that not incorporating these features of raptor populations in our models oversimplifies what likely occurs in nature, but we believe the model outputs adequately illustrate the probable impacts of harvest on wild raptor populations.

In our initial model runs, we incorporated harvest effects by decreasing first-year survival rates in 0.01-unit increments, which would be the case if all harvest was of passage raptors. For comparison purposes, we also simulated an eyas-only and adult-only harvest of peregrine falcons by decreasing productivity values, and by increasing adult mortality values, respectively, by 0.01-unit increments. Response variables of interest at Moffat's equilibrium after

Table 2. Number of raptors removed from the wild by licensed falconers in the United States in 2003 and 2004 according to United States Fish and Wildlife Service records. Population size estimates are from Rich et al. (2004), which are based on population size estimates derived from Breeding Bird Surveys from the 1990s. Percent harvest estimates use the mean number harvested.

Species	North American population size[a]	Estimated % juveniles[b]	No. juveniles[b]	No. harvested			% juveniles harvested	Recommended max. harvest rate
				2003	2004	Mean		
Sharp-shinned hawk	291,500	0.50	145,750	15	15	15	0.0103	1.0%
Cooper's hawk	276,450	0.50	138,225	67	72	69.5	0.0503	1.0%
Northern goshawk	120,050	0.30	36,015	52	46	49	0.1361	5.0%
Harris's hawk	19,500	0.25	4,875	50	32	41	0.8410	5.0%
Ferruginous hawk	11,500	0.30	3,450	7	6	6.5	0.1884	1.0%
Red-shouldered hawk	410,850	0.30	123,255	3	3	3	0.0024	1.0%
Red-tailed hawk	979,000	0.30	293,700	527	645	586	0.1995	4.5%
American kestrel	2,175,000	0.60	1,305,000	100	101	100.5	0.0077	1.5%
Merlin	325,000	0.60	195,000	48	52	50	0.0256	1.0%
Gyrfalcon	27,500	0.30	8,250	8	19	13.5	0.1636	1.0%
Peregrine falcon	9,870[c]	0.30	2,961	1[c]	18	18	0.6079	5.0%
Prairie falcon	17,280	0.50	8,640	31	42	36.5	0.4225	1.0%
Eastern screech-owl	369,600	0.60	221,760	1	0	0.5	0.0002	1.0%
Western screech-owl	270,100	0.60	162,060	0	3	1.5	0.0009	1.0%
Great horned owl	1,139,500	0.30	391,850	6	7	6.5	0.0020	1.0%
Snowy owl	72,500	0.30	21,750	1	1	1	0.0046	1.0%
Total				917	1,062	998		

[a] Unless otherwise noted, taken from Rich et al. (2004) but modified as described in the Methods. Units are total number of individuals.

[b] The percentage of juveniles was estimated from observed population structure in species-specific population models at equilibrium (see Fig. 1 and Table 1). Estimates for sharp-shinned hawks and Cooper's hawks are from the model for the Eurasian sparrowhawk; estimates for the red-shouldered hawk, ferruginous hawk, great horned owl, and snowy owl are from the model for the red-tailed hawk; estimates for the merlin and screech-owls are from the model for the American kestrel; and estimates for the gyrfalcon are from the model for the peregrine falcon.

[c] Harvest of peregrine falcons is limited to states west of the 100th meridian, and that is the population included here. This population size estimate is from United States Fish and Wildlife Service (2004), based on direct counts from states. Harvest of wild peregrine falcons for falconry was authorized only in Alaska in 2003 but was expanded to include other western states in 2004.

100 years of harvest at the specified rates included resultant numbers of breeders (N_b), juveniles (N_j), subadults (N_s), and floating adults (N_f); the annual rate of population change (λ) if all breeding-age adults were able to breed and produce young at the rate of the population mean; and the floater-to-breeder ratio (ζ), which is the ratio of nonbreeding adults to breeders. In general, λ is a useful way of gauging the impacts of harvest in a nonsaturated population where growth is possible, and ζ is the more useful metric when the population is at equilibrium and all breeding sites are occupied (Hunt 1998). We also developed MSY curves with harvest rate as the variable of interest for golden eagles, peregrine falcons, and American kestrels. These 3 species represent the range of harvest potential based on available data.

To estimate actual harvest rates, we divided the number of individuals of each species harvested by the estimated size of the juvenile population of each species. We used the average of the number of individuals of each species harvested in 2003 and 2004 as the numerator. We estimated the denominator by multiplying the overall population estimate for each species by an estimate of the proportion of the population that was $\leq$1 year old (and, therefore, subject to harvest). We based our estimate of the proportional size of the $\leq$1-year-old age class on the species-specific population structure from our models at the 0% harvest rate at Moffat's equilibrium. For species for which we lacked data to develop specific models, we used the model output for the species with the most similar life-history characteristics. Estimates for sharp-shinned hawks and Cooper's hawks are from the model for the Eurasian sparrowhawk; estimates for the red-shouldered hawk (*Buteo lineatus*), ferruginous hawk (*B. regalis*), great horned owl, and snowy owl (*Bubo scandiacus*) are from the model for the red-tailed hawk; the estimate for the merlin (*F. columbarius*), Eastern screech-owl (*Megascops asio*), and Western screech-owl (*M. kennicottii*) are from the model for the American kestrel, and estimates for the gyrfalcon are from the model for the peregrine falcon.

Results

Actual Falconry Harvest in 2003 and 2004

Falconers harvested 917 and 1,062 raptors of 15 species from the wild in the United States in 2003 and 2004, respectively (Table 2). Although the most frequently harvested species was the red-tailed hawk, the estimated harvest rate was greater for the Harris's hawk, peregrine falcon, and prairie falcon. For all species, the estimated harvest rate was below 1.0% of the juvenile cohort.

Modeled Impacts of Harvest on Populations

Passage harvest models for all 8 example raptor species at Moffat's equilibrium showed that numerical effects of harvest primarily are restricted to the subadult and floating adult components of populations (Fig. 1). When higher harvest rates compromise the equilibrium, floaters are absent because all adults are able to acquire breeding sites. At the highest levels of harvest, equilibrium population size of all age classes are predicted to be substantially below that at MSY, and the degree of reduction is related to the degree to which harvest rate exceeds MSY. The harvest rate at MSY

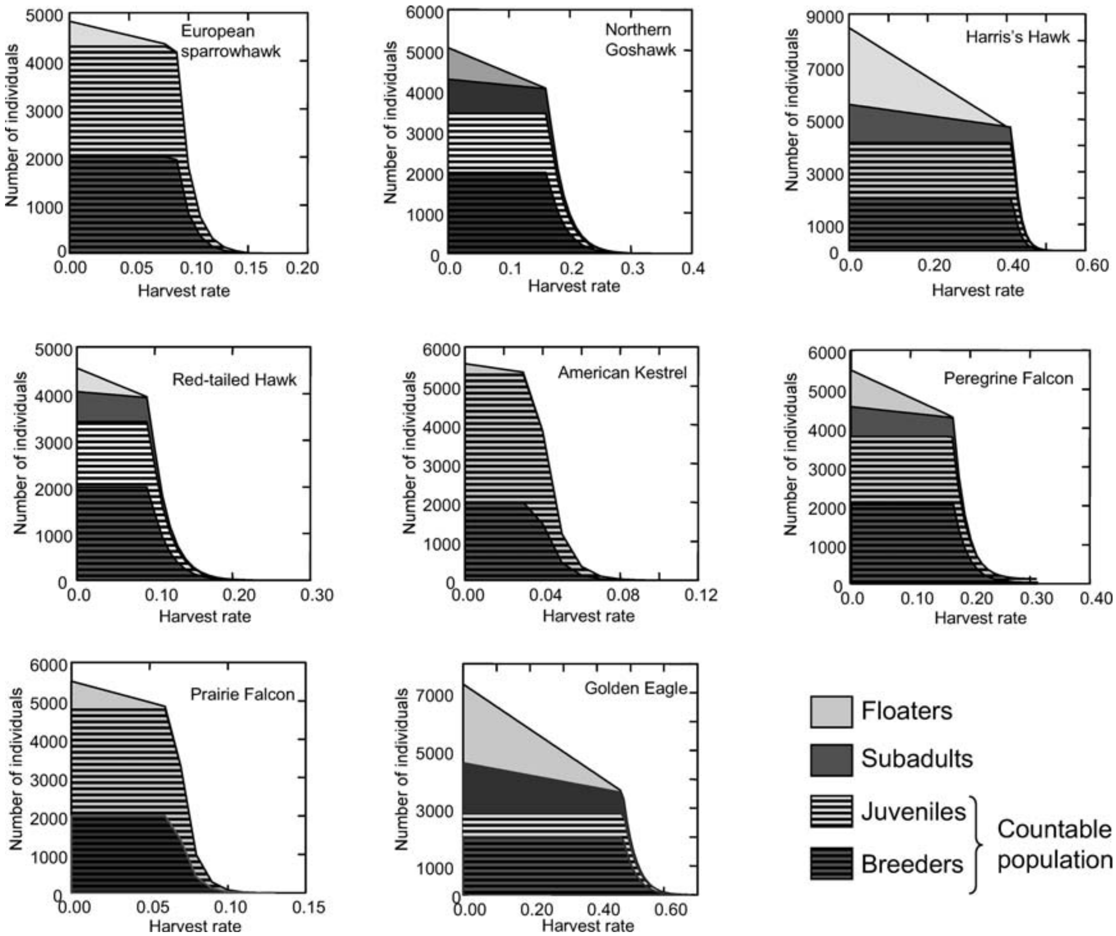

Figure 1. Estimated population structure of 8 raptor species at various passage harvest rates (percentage of juvenile cohorts taken by falconers) based on demographic data from contemporary time periods (1971–2002; see references in Table 1 for specific study periods). See Methods section in text for definitions. The component of the population that can be accounted for through nest-site monitoring is cross-hatched. For all species effects of harvest on populations below the harvest rate at maximum sustainable yield (MSY) are primarily in population segments that are not associated with nest sites. Above the MSY harvest rate, nest-site occupancy and production are maintained at lower equilibrium levels than would otherwise be supportable.

differs considerably depending on the age classes included in the harvest and, as expected, is greatest for a harvest of eyases and lowest for a harvest of adults (Table 3; Fig. 2). The MSY passage harvest rate varies among species in accordance with variation in vital rates (Fig. 3) and this variation also is apparent in changes in λ for unsaturated populations of those species (Fig. 4).

Discussion

Our results suggest that the sustainability of falconry harvest varies among raptor species in accordance with variation in vital rates. Model predictions indicate a comparatively low relative harvest potential for several species (Eurasian sparrowhawk, red-tailed hawk, American kestrel, prairie falcon). We suspect this is largely due to the underestimation of vital rates for these species because survival rates for them were derived from banding or marking studies that did not include unbiased correction for emigration, and to a lesser degree for the effects of differential mortality among age classes, which can affect reporting rates (Newton 1979, Kenward et al. 2000). In contrast, vital rate estimates for goshawks, golden eagles, and to a lesser degree, peregrine falcons, were based on radiotracking or marking studies that allowed for estimation and correction for these biases. As Kenward et al. (2000) showed, banding and marking typically greatly underestimate survival in raptors relative to findings for the same populations from radiotagging studies. Our findings highlight the need for better information on vital rates of these raptors.

Our model output confirms, at least for the peregrine falcon, that the impacts of harvest are proportional to the age of the cohort harvested, with nestling harvest having the least impact. This is consistent with findings of many previous studies that show raptor populations are most sensitive to changes in adult mortality rates (Newton 1979). Changes in raptor populations in response to sustainable harvest are largely restricted to the subadult and floating adult components of the populations, neither of which is amenable to population monitoring by traditional methods of counting breeding adults and young at nest sites. Overharvest initially would produce a decrease in the number of floating adults, which likely would increase the

Table 3. Summary of model output for 8 species of raptors using demographic data in Table 1. All original demographic data are from contemporary time periods (1971–2002); specific dates of individual studies can be found by consulting the references in Table 1. The floater/breeder ratio (ζ) is descriptive of saturated populations at Moffat's equilibrium, whereas the annual rate of population change (λ) is applicable for populations that are below carrying capacity and still capable of growth. The harvest rate at maximum sustainable yield (MSY) assumes populations are at Moffat's equilibrium and likely are not representative of maximum sustainable harvest rates for all populations of the species.

Species	Age of harvest	Initial ζ	Initial λ	Harvest rate at MSY
Eurasian sparrowhawk	Passage	0.26	1.07	0.06
Northern goshawk	Passage	0.39	1.05	0.16
Harris's hawk	Passage	0.45	1.45	0.41
Red-tailed hawk	Passage	0.25	1.03	0.09
American kestrel	Passage	0.14	1.04	0.03
Peregrine falcon	Eyas	0.46	1.06	0.31
Peregrine falcon	Passage	0.46	1.06	0.16
Prairie falcon	Passage	0.37	1.07	0.06
Golden eagle	Passage	1.35	1.07	0.31

number of younger breeders at nests (Newton 1979, Ferrer et al. 2003) and could eventually cause a decrease in nest-site occupancy. Monitoring trends in the age of breeders at nests could provide an early indication of decline (Ferrer et al. 2003), but such a pattern also would also be expected in an unsaturated population that was increasing (Newton and Mearns 1988, Tordoff and Redig 1997).

Our models oversimplify what would be expected to occur in nature, and ideally our predictions should be tested experimentally with wild populations. We encourage study in this area but recognize that the logistics of such work will be daunting given the difficulty measuring population responses among nonbreeders. Previous attempts to estimate sustainable harvest rates for raptor populations have examined empirical data on rates of recovery of depleted populations, sustainability of populations under persecution, or, in one case, population responses to experimental harvest (Conway et al. 1995, Kenward 1997). The conclusions of these analyses generally mirror what we found: that many raptor populations can sustain eyas or passage harvest rates of 10–20% and sometimes higher. This increases our confidence in the results presented here. That said, we also believe a degree of caution is warranted in applying these results. The MSY approaches to harvest management frequently overestimate sustainability, and monitoring capabilities often are not adequate to determine when harvest rates need to be reduced or modified (Ludwig et al. 1993). Moreover, deterministic models can produce overly optimistic projections of sustainability by masking the consequences of stochastic events that can temporarily depress production or elevate mortality (Beissinger and Westphal 1998).

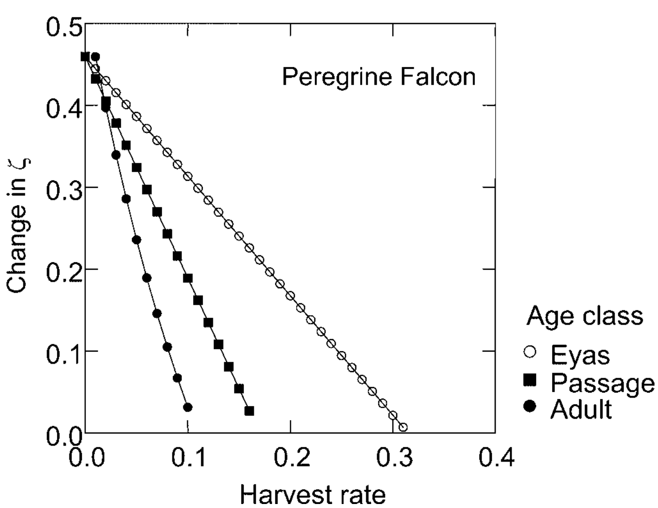

Figure 2. Change in floater/breeder ratio (ζ) with increasing harvest rate in a hypothetical peregrine falcon population at Moffat's equilibrium, using demographic data in Table 1. Under these demographic parameter values, the harvest rate at maximum sustainable yield is 3 times greater for an eyas-only harvest compared to a harvest of adults.

In our models we used demographic values that, while realistic for the species, are not likely representative of all populations of those species at all times. Though this justifies caution in applying our findings to local populations, we believe that our overall findings are representative for raptor populations in healthy condition. In declining populations, harvest would amplify declines commensurate with harvest rate. However, to determine the ultimate effects of falconry harvest on a declining raptor population, it would be important to know the cause of the decline. For example, we doubt that raptor populations declining due to locally deteriorating habitat conditions or declines in food availability would be appreciably impacted over the long term by falconry harvest if the proportion harvested remained constant through the range of changes in population size. This is because, once the population reached carrying capacity under the new conditions, demographic values would be expected to stabilize at healthy levels. On the other hand, population declines in species experiencing excessive mortality or reproductive failure would be exacerbated by harvest at any level and, unless the underlying cause of the decline was remedied or the harvest stopped, extirpation or extinction would occur more rapidly than would otherwise be the case.

Our analyses, which assume that raptor harvest constitutes an irrevocable additive mortality effect on populations, are conservative for 2 reasons. First, not all raptors harvested by falconers are permanently removed from the wild. Mullenix and Millsap (1998) reported that about 40% of falconer-

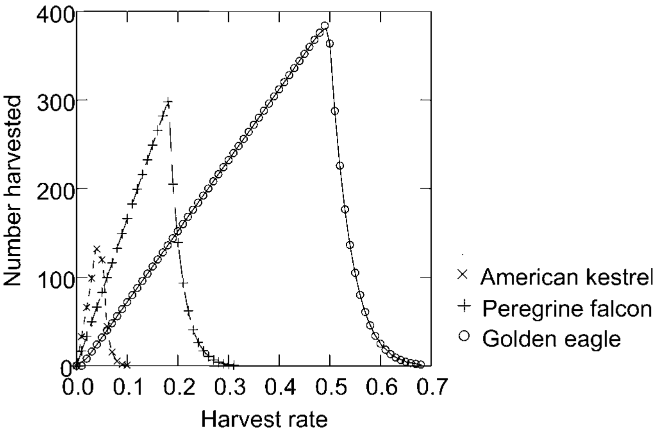

Figure 3. Harvest equilibrium curves for 3 species of raptors representing the range of harvest potential observed. Modeled harvest is of passage individuals, and models use the demographic data for each species from Table 1.

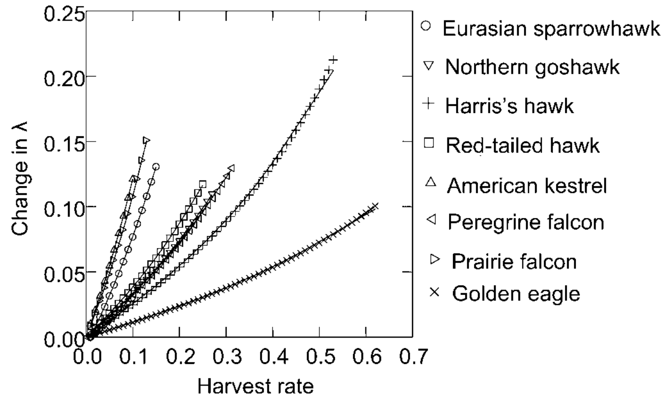

Figure 4. Change in population growth rate (λ) with changing passage harvest rate for 8 species of raptors at harvest levels below maximum sustainable yield, using demographic parameter values from Table 1.

harvested red-tailed hawks and American kestrels are either purposefully or accidentally returned to the wild each year. Survival rates and fitness of these birds are unknown, but some almost certainly survive and return successfully to the wild population. For example, in Great Britain, the northern goshawk was reestablished as a breeding species from escaped falconry stock (Kenward 1974, Kenward et al. 1981). Second, Conway et al. (1995) found that nestling prairie falcons left in nests from which siblings were harvested had higher survival and breeding-recruitment rates than nestlings from unharvested nests. This suggests that in the case of eyas harvest there may be a compensatory effect of harvest on survival of remaining nestlings.

Management Implications

Our results suggest that harvest strategies employed by agencies seeking to regulate the take of raptors by falconers should manage take based on each species' ability to sustain harvest, recognizing that for some species the state of current knowledge probably underestimates that capacity. Further, we believe that harvest rates should be conservative given the potential for MSY-based analyses to overestimate sustainability and the impracticality of measuring the actual effects of harvest on wild raptor populations. Finally, limiting take to eyas and passage raptors, as is currently the case for most species, is an effective strategy for limiting effects of harvest on populations.

As a practical guide, we recommend that in the United States, harvest of juvenile raptors be limited to one-half of the estimated MSY up to a maximum of 5%, depending on species-specific estimates of capacity to sustain harvest. We suggest that the available information on vital rates are sufficient to justify harvest rates of up to 5% for northern goshawks, Harris's hawks, peregrine falcons, and golden eagles; species with estimated MSYs greater than twice this value. We advocate harvest rates of one-half MSY for other North American species we assessed and harvest rates of 1% for species without adequate demographic data to estimate MSY until better estimates of vital rates confirm greater harvest potential (Table 2). We believe that harvest rates below these levels are unlikely to produce discernible effects on raptor numbers or the sustainability of otherwise healthy populations and probably are inconsequential in declining populations if those declines are caused by a reduction in the amount of suitable habitat or prey availability.

One obvious difficulty in this approach is the lack of reliable annual information on abundance for raptor species from which to calculate harvest rates. The BBS-based abundance estimates we used here likely are conservative for most species, particularly with the modification we employed that eliminated the visibility correction factor used by Rich et al. (2004). Given this, and considering that most raptor populations tend to be fairly stable from year to year (Newton 1979), annual estimates of abundance may not be necessary for management of falconry take. Rather, we suggest the approximate annual harvest rate estimates derived from known annual harvest divided by the estimated number of juveniles in Table 1 should suffice to identify species for which harvest might be approaching the thresholds identified here. Under this approach, we suggest that juvenile population-size estimates for species with declining BBS trends be recalculated every 3 years and that those for other species be revised every 6 years. While BBS-based population estimates will never be ideal for raptors, they could be improved if future recalculations included some measure of annual variation so that confidence intervals could be constructed for the estimates.

The approach outlined above seems particularly appropriate when one considers that estimated harvest rates in 2003 and 2004 for all raptor species in the United States were well below the recommended thresholds. The primary harvest regulation mechanism in effect in these years was a 2-bird-per-falconer limit on the number of raptors that could be removed from the wild each year, in conjunction with an overall maximum possession limit of 3 birds. Thus, even with some 4,250 licensed falconers in the United States (USFWS files) and a potential harvest of up to 8,500 raptors, harvest rates were extremely conservative under this regulatory framework; only 11.7% of the recommended allowable take occurred.

Although we include golden eagles in our analysis, harvest of golden eagles is regulated differently than other falconry species. The Bald and Golden Eagle Protection Act (16 U.S.C. 668–668d) provides added restrictions specific to the take of golden eagles: only falconers with >7 years of overall falconry experience and eagle-handling experience may take golden eagles from the wild and only in certified depredation areas. Therefore, take of golden eagles for falconry is far more limited than is other falconry harvest.

Our assessment indicates take of wild raptors for falconry is very unlikely to have a significant adverse impact on wild raptor populations in the United States. Because of the limited participation in falconry and because nearly half of all raptors used in the sport are produced through captive breeding and not taken from the wild (Peyton et al. 1995), we believe impacts are unlikely to increase. Nevertheless, our recommendations provide a relatively easy and cost-effective way to track the potential national impact on an annual basis using harvest reports already being provided by falconers. Only if the potential for impacts increase, either through substantial growth in the number of licensed falconers or an increase in harvest rates for a particular species, would additional safeguards be necessary.

Acknowledgments

We are indebted to G. Hunt for help in all phases of this analysis, but particularly for sharing software for modeling raptor population structure at Moffat's equilibrium. The manuscript benefited greatly from reviews and constructive criticism by W. Burnham, J. Enderson, G. Hunt, R. Kenward, M. Mullenix, K. Wilkins, and an anonymous reviewer.

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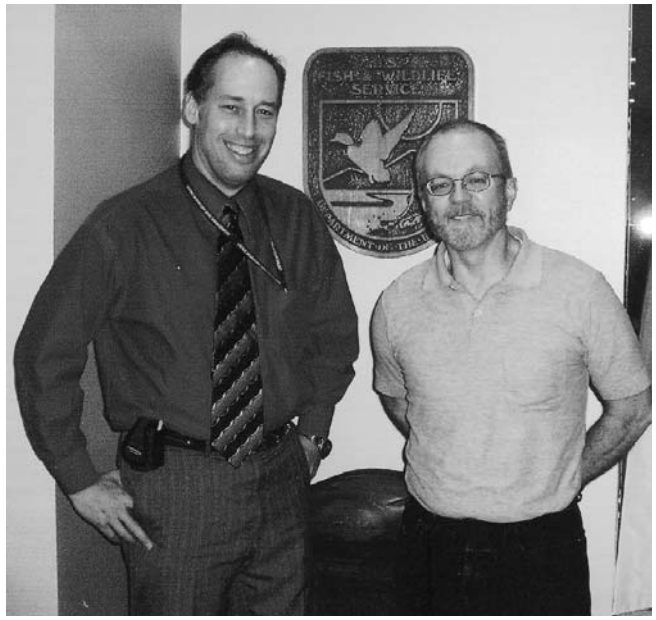

Brian A. Millsap (left) is currently New Mexico State Administrator for the United States Fish and Wildlife Service, but at the time this paper was written he was Chief of the United States Fish and Wildlife Service's Division of Migratory Bird Management in Arlington, Virginia, a position he held since 2002. He holds a B.S. in wildlife biology from Colorado State University and an M.S. in evolutionary and systematics biology from George Mason University. Prior to working for the Fish and Wildlife Service, he served as Chief of the Bureau of Wildlife Diversity Conservation for the Florida Fish and Wildlife Conservation Commission, as a raptor biologist for the National Wildlife Federation, and as a wildlife biologist for the Bureau of Land Management in Arizona and Wyoming. He is a past president of the Raptor Research Foundation, North American Falconers Association, and Florida Chapter of the Wildlife Society. ***George T. Allen*** (right) is the Chief of the Branch of Policy, Permits, and Regulations in the Division of Migratory Bird Management. He completed a B.S. at the Pennsylvania State University, an M.S. in Environmental Science at Washington State University, and a Ph.D. in zoology at North Dakota State University. He has worked for the Washington Department of Wildlife and for the Fish and Wildlife Service. He spent about 10 years assessing environmental contaminants for the Service before moving to Migratory Bird Management, where he's been for about 9 years. He served as President of the Kansas Chapter of the Wildlife Society and Newsletter Editor for the Central Mountain and Plains Section.

Associate Editor: *Euler.*

APPENDIX E

Draft Reporting Forms

U.S. FISH & WILDLIFE SERVICE - MIGRATORY BIRD PERMIT OFFICE
EAGLE TAKE (§ 22.26) - ANNUAL REPORT

PERMITTEE: ______________________________________
ADDRESS: ______________________________________
____
City State Zip Code
9 Check here if reporting a change of name, address, or contact inform

PERMIT NUMBER: ______________________
REPORT FOR CALENDAR YEAR*: _________
REPORT DUE DATE: ______________________
PHONE: (______)______-____________
Email: ____

INSTRUCTIONS: Type or print the information requested below for each Important Eagle-Use Area (IEUA) identified on your permit during the year covered by this report and return the completed report to the above address by the due date. Filing an accurate annual report is a condition of your permit. Failure to file a timely report can result in permit suspension. Please note that the absence of eagles from an IEUA you are monitoring will in no way affect the continued validity of your permit. Accurate reporting will play an essential role in future eagle management**. Use a separate supplemental sheet for each IEUA identified on your permit.**
MAKE SURE YOU SIGN & DATE THE CERTIFICATION STATEMENT BELOW BEFORE YOU SUBMIT YOUR REPORT. (50 CFR parts 13, 21, & 22)

IMPORTANT USE AREA :

Identify nest, communal roost, or foraging area. If more than one of one type of IEUA is identified on your permit, designate which nest (or roost or foraging area) data applies to.

DATE EAGLES OBSERVED	**TIME OF DAY**	**NUMBER OF EAGLES OBSERVED** (If in large numbers, please estimate)	**OBSERVED BEHAVIOR** P – perched F – feeding N – sitting on or attending nest IF– in flight	**DESCRIPTION OF HUMAN ACTIVITY AT TIME EAGLES WERE OBSERVED** (e.g., surveying; excavation; pile driving; interior work, etc.) If activity is completed, enter "Completed"

CERTIFICATION: I certify that the information in this report is true and correct to the best of my knowledge. I understand that any false statement herein may subject me to the criminal penalties of 18 U.S.C. 1001.

Signature: ____ Date:

OMB No. 1018-xxxx Expires x/xx/xxxx Form 3-202-15

SUPPLEMENTAL SHEET

EAGLE TAKE ANNUAL REPORT	**REPORT YEAR__________**	**SUPPLEMENTAL PAGE #:____**
PERMITTEE:_________________________________	**PERMIT NUMBER:_________________**	

IMPORTANT USE AREA :
Identify nest, communal roost, or foraging area. Use a separate supplemental sheet for each IUA

DATE EAGLES OBSERVED	**TIME OF DAY**	**NUMBER OF EAGLES OBSERVED** (If in large numbers, please estimate)	**OBSERVED BEHAVIOR** P – perched F – feeding N – sitting on or attending nest IF– in flight	**DESCRIPTION OF HUMAN ACTIVITY AT TIME EAGLES WERE OBSERVED** (e.g., surveying; excavation; pile driving; interior work, etc.) **If activity is completed, enter "Completed"**

FWS FORM 3-202-15

U.S. FISH & WILDLIFE SERVICE - MIGRATORY BIRD PERMIT OFFICE
EAGLE NEST TAKE (§ 22.27) - REPORT

PERMITTEE: ______________________________________
ADDRESS: ____
____
City State Zip Code
9 Check here if reporting a change of name, address, or contact information

PERMIT NUMBER: ________________________
REPORT FOR CALENDAR YEAR*: __________
*Programmatic take only
PHONE: (______)______-___________
Email: ____

Instructions: Complete all sections. MAKE SURE YOU SIGN & DATE THE CERTIFICATION STATEMENT BELOW BEFORE YOU SUBMIT YOUR REPORT.

1. ☐ Bald Eagle Nest Take ☐ Golden Eagle Nest Take

2. Did (does) the permit authorize take of a specific nest or nests?

☐ Yes. ☐ No, the permit authorizes programmatic nest take.

3. Provide the following information for each authorized nest take. If more than one nest was taken, please complete a supplemental page for each nest.

A. Date the authorized nest take occurred: ____ /____/_______

B. Location of the nest that was taken: ____

C. Disposition of the nest: ____Destroyed ____Relocated within territory ____Relocated outside territory ____Donated to a permitted recipient ____Destroyed, substitute nest provided in territory ____Destroyed, substitute nest provided outside territory

D. If nest was relocated or a substitute nest provided, are adult eagles tending the new nest? ____Yes ____No ____No, but nest removal was conducted outside eagle breeding season ____ Do not know

E. If nest was active, disposition of chicks and eggs (e.g., name and contact information of permitted rehabilitator, State agency, or USFWS):

____

4. Describe the mitigation measures you have conducted to offset the nest take. If your permit does not require mitigation, you may leave this blank.

CERTIFICATION: I certify that the information in this report is true and correct to the best of my knowledge. I understand that any false statement herein may subject me to the criminal penalties of 18 U.S.C. 1001.

Signature: ______________________________________ Date:

OMB No. 1018-xxxx Expires x/xx/xxxx Form 3-202-16

EAGLE NEST TAKE REPORT **SUPPLEMENTAL SHEET**

PERMITTEE:___________________________________	**REPORT DATE** ____________ **PERMIT NUMBER:**_________________	**SUPPLEMENTAL PAGE #:**____

3. Provide the following information for each authorized nest take.

A. Date the authorized nest take occurred: ____ /____/_______

B. Location of the nest that was taken: ____

C. Disposition of the nest: ____Destroyed ____Relocated within territory ____Relocated outside territory ____Donated to a permitted recipient ____Destroyed, substitute nest provided in territory ____Destroyed, substitute nest provided outside territory

D. If nest was relocated or a substitute nest provided, are adult eagles tending the new nest? ____Yes ____No ____No, but nest removal occurred outside the eagles breeding season ____ Do not know.

E. If nest was active, disposition of chicks and eggs (e.g., name and contact information of permitted rehabilitator, State agency, or USFWS):

____

4. Describe the mitigation measures you have conducted to offset the nest take. If your permit does not require mitigation, you may leave this blank.

FWS FORM 3-202-16

APPENDIX F

Projected Change in Total Population for States Having Large Bald Eagle Populations, 2000 to 2030

State	Numerical Change	Percent Change
Wisconsin	787,089	14.7
Minnesota	1,386,651	28.2
Delaware	229,058	29.2
Maryland	1,725,765	32.6
Virginia	2,746,504	38.8
North Carolina	4,178,426	51.9
South Carolina	1,136,557	28.3
Georgia	3,831,385	46.8
Florida	12,703,391	79.5
Washington	2,730,680	46.3
Oregon	1,412,519	41.3
California	12,573,213	37.1
Alaska	240,742	38.4

Data from United States Census Bureau, Population Division, Interim State Population Projections, 2005. Internet release date: 21 April 2005.

Appendix G

Counties among the 100 Fastest Growing that

Also have Bald Eagle Breeding Sites

Rank	Geographic Area	Rank	Geographic Area
1	Flagler County, FL	48	Stafford County, VA
2	Sumter County, FL	49	Canyon County, ID
5	Loudoun County, VA	55	Bryan County, GA
6	Henry County, GA	57	Carver County, MN
7	Pinal County, AZ	59	Montgomery County, TX
11	Osceola County, FL	61	Lake County, FL
12	Douglas County, CO	63	Collier County, FL
14	Lincoln County, SD	64	Horry County, SC
15	Cherokee County, GA	65	Baldwin County, AL
17	Delaware County, OH	66	James City County, VA
19	Madison County, ID	69	Clay County, FL
20	Scott County, MN	71	Union County, GA
22	Lee County, FL	72	Beaufort County, SC
23	St. Johns County, FL	75	Archuleta County, CO
26	Walton County, FL	76	King George County, VA
27	St. Lucie County, FL	77	Wakulla County, FL
30	Culpeper County, VA	79	Indian River County, FL
32	Weld County, CO	80	Suffolk City, VA
34	Wright County, MN	82	Grand County, CO
36	Sherburne County, MN	85	Isanti County, MN
41	Brunswick County, NC	87	New Kent County, VA
42	St. Croix County, WI	89	Lee County, GA
44	Deschutes County, OR	90	Currituck County, NC
45	Prince William County, VA	96	Williamson County, TN
46	Dallas County, IA		

From Housing Unit Estimates for the 100 Fastest Growing Counties With 5,000 or More Housing Units in 2006, United States Census Bureau, August 2007.

Appendix H

Eagle/Aircraft Collisions

Table H.1. Bald Eagle/Aircraft Collision Information

USAF Bird Air Strike Hazard Data 1985-2006[a]		FAA Wildlife Strikes Jan 1990-May 2007[b]	
State	Strikes	State	Strikes
Alaska	1	Alaska	42
Idaho	1	California	1
Michigan	1	District of Columbia	2
Nebraska	1	Florida	20
North Carolina	1	Idaho	2
Oklahoma	1	Illinois	1
Texas	2	Louisiana	2
Unknown	1	Maine	1
Washington	2	Michigan	1
		Minnesota	2
		Mississippi	1
		North Carolina	1
		Nebraska	1
		New Jersey	1
		New York	1
		Unknown	2
		Virginia	3
		Washington	3
Totals	11		87

[a] Data acquired via e-mail from the United States Air Force Bird Airstrike Hazard Team on 8 August 2007.

[b] Source: FAA National Wildlife Strike Database (Level IIIA) - Version 8.8. Downloaded Oct 1, 2007.

Table H.2.Golden Eagle/Aircraft Collision Information

USAF Bird Air Strike Hazard Data 1985-2006[a]		FAA Wildlife Strikes Jan 1990-May 2007[b]	
State	Strikes	State	Strikes
Arizona	3	California	2
Arkansas	1	Montana	1
California	2	Unknown	1
Colorado	1		
Kansas	1		
Louisiana	1		
Maryland	1		
Mississippi	2		
Nebraska	1		
Nevada	1		
New Mexico	2		
North Carolina	1		
Oklahoma	1		
Oregon	1		
Texas	2		
Unknown	7		
Totals	28		4

[a] Data acquired via e-mail from the United States Air Force Bird Airstrike Hazard (B.A.S.H.) Team on 8 August 2007. Table reflects only those confirmed by experts at the Smithsonion Institute as eagles. There are an additional 203 strikes falling under the general categories of "hawks, eagles, kites" and "hawks, eagles, vultures, falcons" for which the species was not determined.

[b] Source: FAA National Wildlife Strike Database (Level IIIA) - Version 8.8. Data accessed 1 October 2007.

Appendix I

Existing Eagle Permits

Bald Eagle

Table I.1. Scientific Collecting

Year	State	Actions Authorized						Actions Reported			
		Birds	Trap and Release	Relocate	Eggs	Nests	Age	Eggs	Action	Birds	Action
2002	AK	0	0	0	5	0		0			
2002	AK	0	0	0	15	0		2	Held		
2002	AK	0	0	0	15	0		1	Held		
2002	AK	0	0	0	15	0		0			
2002	AK	0	0	0	30	0		7	Held		
2002	AK	0	0	0	15	0		0			
2002	AK	0	0	0	15	0		10	Held		
2004	AK	20	0	0	20	0	Eggs, Runt Chicks				
2006		0	100	0	0	0		0		23	Sampled, Released

No permits were given to trap and retain bald eagles.

Bald Eagle

Table I.2. Depredation

Year	Service Region	State	Relocate	Haze	Birds	Action
2002	1	OR	0	4	0	
2004	6	UT	0	10	10	Hazed
2005	3	WI	0	1	50	Hazed
2005	6	NE	0	20	0	
2006	1	OR	0	12	6	Hazed
2006	1	WA	0	1	3	Hazed
2006	3	MO	0	1	0	
2006	6	CO		4	2	Hazed
2006	6	NE		20	0	
2007	1	OR	0	12	5	Hazed
2007	6	NE	0	20	0	
2007	3	MN	5	1	0	
2007	3	WI	0	1	0	

No permits were given to take, trap and retain, or take eggs or nests.

Golden Eagle

Table I.3. Scientific Collecting

Year	State	Trap and Release	Relocate	Haze/Harass	Birds
2002	WY	30	0	0	7
2002	WY	40 over 3 years	0	0	7
2003	WY, CO	0	15 over 3 years	0	0
2006	UT	0	0	30 Nests	0
2007	NM	0	3	0	3
2007	UT	0	0	10 Nests	0
2007	WY	0	0	10 Nests	0
2007	CO	0	0	10 Nests	0

No permits were given for take of eggs or nests.

Table I.4. Resource Recovery Nest Take

Year	State	Authorized	Action	Number	Action
2002	WY	1	Relocate man-made nest	0	-
2002	WY	1	Take	0	-
2002	WY	2	Take/Transport - mine	0	-
2002	WY	1	Relocate - mine	0	-
2003	CO	1	Remove from tower	1	Relocated
2003	NM	1	Remove from tower	1	Relocated
2003	WY	1	Take -mine reclamation	0	-
2004	WY	2	Relocate - mine	2	Relocated
2005	CA	1	Take	1	Destroyed
2005	NM	1	Remove/relocate/block access - cliffs near turbines	2	Relocated
2005	MT	1	Take - mine	0	-
2006	SD	2	Remove/relocate - transmission line	2	Relocated
2006	WY	1	Relocate	0	-
2006	WY	2	Relocate	1	Relocated
2007[a]	NM	3	Relocate		
2007	NM	1	Remove/block access - cliffs near turbines		

[a] Reports for 2007 not yet received.
No permits were given to kill or to trap and retain, or to relocate.
No take of eggs was authorized.

Table I.5. Indian Religious Take

Year	State	Authorized	Reported Take	Age
2002	AZ	40	14	Nestling
2003	AZ	40	12	Nestling
2004	AZ	40	26	Nestling
2005	AZ	40	25	Nestling
2006	AZ	40	22	Nestling
2006	NM	2	2	Immature
2007	AZ	40	36	Nestling
2007	NM	1	1	-
2007	NM	2	2	Mature

No permits were given for take of eggs or nests.

Table I.6. Depredation Permits

Year	State	Trap/ Retain	Relocate	Eggs	Haze	Birds	Action	Eggs	Action	Nests	Action
2002	OR	0	0	0	1	0		0			0
2002	SD	0	1	0	1	7	Relocated	0			0
2002	WY	0	1	0		1	Trapped and Released	0			0
2003	SD	0	1	0	1	0		0			0
2003	UT	0	10	0	10	0		0			0
2003	WY	0	1	0	1	6	Transferred for Falconry	0			0
2003	WY					1	Banded	0			
2004	CA	0	15	0		4	Relocated	0			0
2004	UT	0	16	0	16	9	Relocated	0			0
2004	UT					5	Hazed	0			
2004	WY	8	0	0		4	Transferred for Falconry	0			0
2005	CA	0	10	2		4	Relocated	2	Destroyed	2	Destroyed
2005	CA	0	0	0	2	2	Hazed	0			0
2005	CA	0	20	0		4	Relocated	0			0
2005	SD	0	1	0	1	0		0			0
2005	UT	0	15	0	15	0		0			0
2005	WY	8	0	0		4	Transferred for Falconry	0			0
2006	CA	0	10	0		3	Relocated	0			0
2006	CA	0	0	0	2	2	Hazed	0			0
2006	SD	0	1	0	1	0		0			0
2006	WY	10	0	0		5	Transferred for Falconry	0			0
2007	CA	0	-1	0		3	Relocated	0			0
2007	WY	10	0	0				0			0
2007	UT	0	15	0	15			0			0

No take of live eagles or nests was authorized.

Appendix J

Activities for Which Service Regions Anticipate Requests for Permits Developed Under This Proposal

Table J.1. General Development Activities

Region	Private (Housing)	Commercial	Government Sponsored	Transportation
1	X	X	X	X
2	X	X	X	X
3	X	X	X	X
4	X	X	X	X
5	X	X	X	X
6	X	X	X	X
7	X	X	X	X
8	X	X	X	X

Table J.2. Energy Exploration and Development Activities

Region	Fluid Minerals (oil, gas, geothermal)	Coal and Other Energy Mining	Geophysical Exploration	Pipelines and Transmission Corridors	Power Plants	Hydro-electric
1	X			X	X	X
2	X	X	X	X	X	
3	X	X	X	X	X	X
4	X		X	X	X	X
5	X	X		X	X	X
6	X	X	X	X	X	X
7	X		X	X	X	
8	X			X	X	X

Table J.3. Types of Activities Potentially Resulting in Disturbance

Region	Non-energy Mining	Agricultural and Habitat-related Activities[a]	Recreation	Aircraft and Airfields	Military Training	Timber Harvest
1		X	X	X		X
2		X	X	X	X	
3	X	X	X	X	X	X
4	X	X	X	X	X	X
5	X	X	X	X	X	X
6	X	X	X	X	X	X
7	X		X	X	X	X
8		X	X	X		X

[a] For disturbance associated with carrying out activities. This category also covers activities such as habitat restoration and Clean Water Act Section 404 permitting.

Table J.4. Types of Activities Potentially Resulting in Mortality

Region	Power Lines	Communication Towers	Wind Development	Transportation	Timber Harvest
1	X	X	X		X
2	X	X	X		
3	X	X	X		X
4	X	X			X
5	X	X	X	X	X
6	X	X	X	X	X
7	X	X	X		X
8	X	X	X		X

Appendix K

Comments on Draft EA with Service Responses

We include here a summary of comments provided on the DEA, with our responses. Comments specific to the proposed rule are addressed in the Final Rule, and comments limited to specific edits are addressed by making the recommended edits, as needed.

Comment	Response
The EA definition of short-term disturbance should be modified to include disruptions in the current year. As proposed, it indicates the decrease in recruitment would occur the following year.	We have revised the sentence to read: “A short-term disturbance reduces productivity in a given year and there is a decrease in recruitment into the following year equivalent to the average number fledged per occupied territory.” We acknowledge there may be additional affects from disturbance such as reduced fitness of fledglings leading to reduced juvenile survival. However, we do not have data sufficient to quantify that value, and are attempting to avoid an overly-complicated and cumbersome permitting system.
The statement “TRM of individual eagles and the consequence of nest disturbance are the same” is wrong. The EA needs to reflect the fact that loss of a juvenile or nesting attempt is comparatively insignificant to loss of an adult or adult breeder.”	The different impacts to the population between the losses of juvenile or nesting attempt and the loss of an adult would be true at low population levels. However, as long as there is a floater population, which is an assumption of the models, the ages of birds taken do not significantly affect the composition of the population. If we are able to increase our knowledge of key demographic parameters, such as the age distribution of the population and age-specific mortality, we will modify the parameters used in the models as indicated by the data.

Comment	Response
The EA downplays the impacts from the growing human population currently and in the future, implying that cumulative effects (at least for bald eagles) will likely be localized because population growth will be localized, but in all likelihood, human population will dramatically grow in many areas not now considered major growth areas. In MT, the fastest growing counties are where the eagles are. Such impacts should be given more attention in the EA	This issue is addressed in the Final EA (FEA). Additional potential impacts to eagle populations have led us to more conservative limits on disturbance permits and take than were proposed in the Draft EA. In addition, the FEA includes provisions for enhanced coordination with State and Tribal wildlife agencies (to be developed with the implementation guidance for the rule) that will provide local expertise to assist the Service in responding more appropriately to area-specific needs.
The EA needs to more fully address the impacts of lead poisoning which is a serious issue. The Service should consider requiring programmatic permits for ammunition manufacturers or for states that still allow lead shot to be used for upland game hunting.	While we recognize the seriousness of the issue of lead poisoning, we do not believe it is necessary to expand the discussion. In addition, the intent of the assessment is not to provide an encyclopedic discussion of individual mortality factors. For extant impacts, they are already inherent in the population information and included in the assessment of the affected environment. Additional potential impacts are addressed in the Final EA, and have led us to more conservative limits on disturbance permits and take than were proposed in the Draft EA. However, should ammunition manufacturers, States, or tribes wish to develop a programmatic permit to address the impacts of lead poisoning, we would work with them to do so.

Comment	Response
The revised definition of “compatible with the preservation of” (increasing or stable populations) is not justified by the BGEPA and is too restrictive.	We are proposing a new permit program, and we must comply with Congressional intent – which is at least a population sufficient to preserve each species. In the DEA and notice re-opening of the comment period on the rule (73 FR 47574, August 14, 2008), to elucidate the statutory standard of “preservation of the bald eagle or the golden eagle,” we proposed the following terminology: “maintaining increasing or stable populations.” We continue to support the essential meaning of that standard, but recognized that it could be misapplied to constrain any authorization of take because any take of a bald or golden eagle by some degree results in a population decrease, even if short-term and inconsequential for the long-term preservation of the species. Thus, if interpreted so narrowly, the word “maintaining” would render us unable to authorize any take. Therefore, we are revising our interpretation of “preservation of the eagle” to read “consistent with the goal of stable or increasing breeding populations.” The phrase “consistent with the goal” will allow take that is compatible with long-term stability or growth of eagle populations. Adding the word “breeding” clarifies the significance of the number of breeding pairs for maintaining or growing populations, versus floaters (non-breeding adults).

Comment	Response
The preservation standard of "increasing or stable populations" is not protective enough. The standard should be to conserve as many eagles as possible while allowing for some minimal take when absolutely necessary. The standard should be 1) significantly less than half the maximum safe values, and 2) lowered even more due to uncertainty associated with local or regional population size.	We disagree that the standard is not protective enough. However, as suggested, we have established more conservative limits on take than were proposed in the Draft EA, because we believe, by using the new thresholds, we will be more able to ensure the standard is met.
What is meant by "no discernible" population decline; is it any decline that is measurable or only one that would adversely affect the eagle's preservation as a species?	Neither option posited by the commenter is intended. Using measurability as the sole basis for a discernible decline, by which we would base management decisions, would ignore the normal population cycles inherent in life histories of wildlife species. On the other hand, a decline that would affect the preservation of the species would be much more substantial. Such a decline would be extremely unlikely under the provisions of the preferred alternative in the Final EA. We intend, through the implementation guidance for these permits, and through implementation of a structured coordination process, to develop more specific criteria for determining when a decline is related to normal population cycles, or is one for which remedial action such as permit threshold adjustment is necessary.
Concern that the public will be required to demonstrate that populations are increasing.	This concern is unfounded. We will base our permitting on the best available population information, but the public will not be expected to provide those data.

Comment	Response
Who will be doing the necessary monitoring and data gathering, including ascertaining whether take was temporary, permanent, or didn't happen, in order to adjust thresholds appropriately? It seems doubtful that anyone has the funding or resources to conduct such monitoring. Even if accurate data could be gathered every five years, it may not be sufficient to ensure take thresholds are not exceeded.	At the national scale, the post-delisting monitoring will provide some of the population data for the bald eagle, and the WEST, Inc. monitoring will provide population demographic information and data for the golden eagle in the four BCRs in which the survey occurs. However, we are prepared to seek out and use data from other sources if available. We have included minimal requirements for reporting on the part of the permittee that would help us ascertain the affects of the activity. We intend, through the implementation guidance for these permits, and through implementation of a structured coordination process, to identify additional needs and resources for management of the thresholds.
Without better data, the conservative modeling done by Millsap (2006) should be adopted.	We agree that the modeling done by Millsap and Allen should be used, in part because of the lack of better data. In addition, our preferred alternative in the Final EA is more conservative than what Millsap and Allen (2006) recommended for falconry take of golden eagles, because new information regarding the status of golden eagle populations indicates that juvenile survival rates for golden eagles may be substantially lower than those used in the 2006 publication. However, it is consistent with the recommendations in Millsap and Allen (2006) for species with high uncertainty.

Comment	Response
The DEA states that the thresholds it includes will remain until new information warrants modification, but does not explain what kind of new information will suffice, and whether the Service will review the thresholds annually.	In general, this means new population information that meets the requirements of the Information Quality Act of 2000. We will reconsider the threshold for any segment of the population of either species when we believe that new data warrant it. Additional specifics will be included in the implementation guidance and during implementation of the enhanced coordination forums proposed in the Final EA.
There are not enough data to support permit issuance, particularly for golden eagles. At the very least, the Good et al 2008 study (survey contracted by the Service to provide statistically-rigorous estimates of golden eagle population size and juvenile to non-juvenile age-ratios in Bird Conservation Regions) needs to be made public. Estimates of vital rates will have dramatic impacts, but data for accurately assessing vital rates are not currently available for many regional populations Also, the high variability of reproductive success needs to be taken into account.	The very conservative limits on permit issuance allowed under the preferred alternative in the Final EA account for the variability in estimates of vital rates as confirmed in sensitivity analyses conducted by the Service which incorporated known variability. The Good et al. 2008 study will be available in final version at the beginning of 2009. We conducted additional sensitivity analyses of the data (Appendix C) in order to incorporate more of the known variability of vital rates into our models. We have used the results of those analyses to revise our recommended thresholds.
For golden eagles, state-to-state satellite telemetry data would yield the information that is critically needed for golden eagles. The Service should establish a National Eagle Monitoring Fund and seek Congressional support.	We agree with the first part of this statement. Studies to better evaluate travel, distribution, and vital rates for golden eagles would allow us to manage golden eagles with less uncertainty. However, the very conservative limits on permit issuance allowed under the preferred alternative in the Final EA account for the variability in estimates of vital rates.

Comment	Response
We recommend that an Alternative 4 be developed that addresses a permitting system for bald eagles only.	We believe that Alternative 1 and the provisions in “Management Common to All Action Alternatives” address all the factors that would be included in an Alternative 4 as proposed in the comment. They ensure that thresholds are compatible with the preservation of the eagle, and allow us to suspend take of either species if populations would not support take. In addition, we believe the programmatic permits proposed are needed to improve conditions for golden eagle populations, and that failure to take those steps would not be compatible with the preservation of the golden eagle.
“Absence of data” should not be used to deny take authorization for infrastructure projects that promote public safety and welfare; rather the “best available science” should be used.	Even though the Eagle Act doesn’t specifically require it, the best available data was used in the FEA. However, the Eagle Act requires the Secretary of the Interior to determine that take will be compatible with the preservation of eagles before he or she may authorize the take. To permit take without sufficient data to show that it is indeed “compatible with the preservation of the eagle” would violate the statutory mandate. If an entity has sufficient knowledge to recognize that it may need a permit for disturbance or take, then it should have sufficient knowledge to allow us to assess its request for a permit.

Comment	Response
Since no funding mechanism has been identified, the program will rely on State resources for surveys and monitoring and provision of data, but States do not have the resources either (and have other management priorities). The EA should acknowledge the need for federal funding or explicitly state that it will fund monitoring through State Wildlife Grants.	We do not believe that the program will rely completely on State resources for surveys and monitoring. Post-delisting monitoring will use updated information provided by the States in partnership with the Service. The WEST, Inc. surveys, upon which we will initially rely for data on golden eagles, are funded by the Service. The Final EA includes a section outlining the kinds of needs the Service has identified in order to adequately manage the permit program and eagle populations. Additional support for surveys and monitoring are noted as priorities, because we would like to improve the amount, accuracy and precision of the data we have and use.
Bald eagle roost monitoring and golden eagle roost and nest monitoring have been inadequate in OR, casting doubt on the models used in the DEA. Baseline monitoring of roosts for both species and nesting golden eagles is needed, certainly before take of goldens is permitted. However, there is no indication that monitoring in the future will provide the necessary data. Therefore, Alternative 1 should be implemented.	Numbers of eagles in roosts are not, to our knowledge, used in determining population numbers. Therefore, monitoring of roosts has limited bearing on permit issuance, unless a permit that would affect a roost is requested. However, identification of important roost areas and intermittent monitoring may be an efficient method for determining their relative value for protective purposes. The permits allowing take of golden eagles under the preferred alternative in the FEA will be very limited, which reflects our concerns about available population information.

Comment	Response
The final EA should establish an adequate monitoring protocol for both species to collect sufficient biological data. Reliable, range-wide, and current data will be necessary.	The development of protocols lies more appropriately with the implementation guidance, the structured coordination teams, and the national golden eagle conservation and management plan as discussed in the FEA. The EA is intended to assess potential impacts due to allowing issuance of permits. Further, recognizing the limitations on data that we will always face, the preferred alternative in the Final EA establishes extremely conservative levels of allowed take.
The PDM cannot be relied on for purposes of permitting, since it can detect only very coarse-scale population changes. And has no bearing to AK (or Texas).	While we agree that the PDM can detect changes at a very coarse scale, it can provide important information on national trends. We will reconsider the threshold for any segment of the population of either species when we believe that new data warrant it. We intend, through the implementation guidance for these permits, and through implementation of a structured coordination process, to identify additional monitoring needs and for management of the thresholds. In addition, if finer-scale, long-term monitoring efforts meet the needs of our permitting program, the Service would rely upon them
We question whether the Service will be able to deny permits based on insufficient data in the face of political pressure.	Our constraint in issuing permits under the Eagle Act is that we cannot authorize take without determining if it is compatible with the preservation of the eagles. Permit issuance will be based on criteria in the preferred alternative in the Final EA, which have been developed using that constraint as our mandate.

Comment	Response
Any reliance on permit thresholds should: (1) be scientifically supported, including peer-review, (2) include objective criteria to take into account natural population fluctuations, and (3) be consistent with federal data quality guidelines.	Permit thresholds are based on a model that was peer-reviewed as part of the publication process. The Final EA establishes extremely conservative levels of allowed take, based on consideration of fluctuations in vital rates, and using the best available data.
The model to be adopted should be developed in collaboration with industry and NGOs and it should be peer-reviewed.	The model was peer-reviewed as part of the publication process. As more information becomes available, we may adopt different models, as developed and agreed to within the context of the structured coordination framework.
The study that was the foundation of the deterministic model for a hypothetical bald eagle population was based on too small a sample size and lacks peer review or any input from other scientists (e.g., Petra Wood, Tom Murphy) who have conducted these types of studies.	The study to which the commenter appears to be commenting (Millsap et al. 2004, Comparative fecundity and survival of bald eagles fledged from suburban and rural natal areas in Florida.), was published in the Journal of Wildlife Management .The model was peer-reviewed as part of the publication process (also, see previous comment response). The Millsap et al. (2004) study is the only contemporary study that provides highly reliable estimates of actual annual bald eagle survival because satellite transmitters were used to determine survival on a relatively large sample of individuals. The survival values used in the demographic model is the most conservative interpretation of the survival data from the Millsap et al. (2004) study, and probably underestimates actual juvenile survival by as much as 4%. The Millsap et al. (2004) estimates were not the only estimates used in the analyses. Where similarly unbiased data were available, the Service used it. For example, for the Region 2 Southwest and Alaskan regional management populations, we employed regionally derived survival estimates from contemporary radio and satellite telemetry studies (as cited in footnotes to table C.3).

Comment	Response
The falconry model used in the DEA does not address the loss of adults from the population. The models used in the DEA will not detect declines in the breeding population. Since take authorizations for these permit regulations are not limited to juveniles and can result in nest failure, and take authorizations will often include effects on the quality and availability of habitat and prey; wild bald and golden eagle populations do not meet these hypothetical population assumptions. Furthermore, the models have not been validated by data from wild populations.	The model cannot be expected to "detect declines in the population," though the model does address the effects of take. Determining appropriate levels of take directly is not practical because important population parameters like productivity and survival fluctuate from year-to-year, and direct counts of nests and young (the typical method for estimating eagle population size and health) do not account for non-breeding eagles, which can make up as much as 30% of healthy eagle populations. For this reason, we used a demographic population model to estimate the likely impact of permitted take at different levels on eagle populations over the long-term. However, the model does incorporate assumptions and known vital rates for all age classes, and the vital rates used were from studies based upon wild populations. In addition, it is important to note that use of the models forms only one portion of the permitting approach. All decisions on individual permits will be based upon site-specific information, including the area population and habitat. In addition, we will be developing and implementing a structured coordination process with State and tribal wildlife jurisdictional entities to enhance our ability to include information on such factors as quality and availability as well as prey.
The Millsap model may not be suitable for bald eagles, since it primarily looks at raptor species with shorter life-spans and higher reproductive rates.	The model can be used for species with different ages at first breeding and survival. It is equally applicable to different raptor species if these factors are considered.
More detailed information should be included in the EA describing the analysis behind the model used – and perhaps some outreach to the states.	The Draft and the Final EA include the Wildlife Society paper, in which the authors describe the model in Appendix D—a relatively simple life-table analysis.

Comment	Response
Take thresholds should not be based on models; the result is overly restrictive, jeopardizing health and safety due to limitations imposed on maintenance of critical infrastructure. Take in the Southwestern Region will be lower than was permitted under the ESA. The Service should abandon the models and base permit issuance on the best available science, and local environmental conditions and local eagle biology, as is done under the ESA.	The models used are based upon the best available science regarding population dynamics and the best available data for the populations considered. Indeed, models are a component of "best available science," along with such things as a good experimental design, a standardized method for gathering data, rigorous statistical analysis, and peer review. However, we readily acknowledge there is always room for improvement, both in the models used, the way they are applied, as well as the amount and quality of the data collected and the methods used. We believe the commitments in the Final EA, which include working towards more localized management when feasible, will provide us with the best opportunity to make those improvements in coordination with States and Tribes. As stated above, the models form only one part of our permitting program, but the models can easily be re-run with regionally derived credible survival rate estimates if those data are shared with the Service. All decisions on individual permits will be based upon site-specific information, including the area population and habitat.
The EA is based on a faulty assumption that each permit will result in a loss of productivity. The presumption should be that each activity will not be likely to result in a loss of productivity.	Our assumption that each permit will result in a loss of productivity is related to the fact we did not want to issue permits unless take was likely to occur. It frames the underlying need for a permit. If the activity is not likely to "disturb" or otherwise take an eagle, then a permit should not be needed. The Service must ensure that the population of either species will not decline as a result of issuance of disturb or take permits. Therefore, we have been conservative in all considerations that affect issuance of permits under the preferred alternative in the Final EA.

Comment	Response
The EA should make the assumption that each take is a long-term take until evidence shows otherwise.	Some of the take permits are to be issued both for the year in which they are requested, and some will be multi-year permits. Given the demonstrated adaptability and resilience of bald eagles (for which most disturb permits will be issued), the approach we are proposing is warranted. The model we used incorporates and demonstrates that any take has a long-term effect, which is reflected by the conservative allowance of take permits for the two species.
What period of time will be used to decide whether the take was temporary or permanent, so that thresholds are adjusted accordingly?	We believe that we will have to assess this on a site-by-site basis, considering how many nests are in a territory, where they are, and who monitors the site.
The EA should commit the Service to reducing or halting permit issuance if any population declines are detected at a regional level.	If data confirm populations at either national or regional scales are declining, depending on the source and severity of the decline, the Service will either establish lower take permit thresholds where appropriate or suspend permitting until data confirm the populations can support take.
Take under the ESA, emergency nest take, and programmatic TRM take should be included in the thresholds because take is take.	We disagree with stating that all the take examples mentioned by the commenter should be unequivocally included in the thresholds. However, we have already stated in the DEA that if we determine that take from emergency nest or programmatic TRM take affects productivity, or if individual permits are likely to have such effects, they will be subject to the thresholds. “Carryover” take under ESA provisions is very limited, and it will actually occur only rarely. For any incidental take exempted under ESA section 7 that is authorized after the date this rule is finalized and that also constitutes take under the Eagle Act, the only permit that is available to provide Eagle Act take authorization is the § 22.26 permit being finalized herein.

Comment	Response
Some TX bald eagles should be grouped with the AZ population rather than eagles to the east, and are greater than 43 miles from the eastern populations. Many of these are relatively isolated; will they be protected?	This population will be protected to the same extent that most other bald eagle populations are protected. A limited population would, by default, mean that few disturb or take permits for that population are issued. Although data available to us distinguish the Sonoran Desert population from other bald eagle populations, our FEA notes that we will include some of the TX bald eagles within the same general management area as those in AZ.
Local populations may not be adequately protected without a process that involves more State input. While a regional approach makes sense it will be critical that the Service protect eagles in more localized areas with lower population densities by coordinating closely with States. CBD: The proposal has inadequate provisions to protect local populations. The Service should examine and delineate other specific populations that require separate analysis.	We expect that each Service Regional office will cooperate with affected States to ensure support of local populations. In addition, the FEA includes provisions that would address cumulative effects, cultural resources, review, and for enhanced coordination with State and Tribal wildlife agencies (to be developed with the implementation guidance for the rule). Provisions for protection of local populations will be developed within the context of the enhanced coordination forums. Furthermore, States and tribes can enact more protective regulations, and the permits under the federal regulation will not be valid if they are in violation of other laws.
Where local and detailed data sets exist (e.g., Sonoran Desert BE pop.), the Service should use those instead of oversimplified models.	The EA **does** use these data when they are available, in order for the models to more closely approximate local conditions. In addition, if finer-scale, long-term monitoring efforts meet the needs of our permitting program, the Service would rely upon them.

Comment	Response
There should be allowances for localized land-use actions that can deal with disturbance take through appropriate mitigation supported by a locally agreed-upon interagency planning effort. This would allow specific solutions to localized land-use issues and would prevent all but very minor or temporary declines in local populations.	While we are unsure we have interpreted the question accurately, we believe the provisions of the programmatic permits and the enhanced coordination forums would meet the concerns expressed in the comment.
The EA needs to address how take will be assessed when it affects both local and distant populations (e.g., wind turbines and migrating eagles). [No suggestion is made as to how to do that.]	At this time, we lack the specific information that would allow us to distinguish between which birds taken are from local and distant populations, so will assume they are resident until and unless information is supplied to demonstrate otherwise. The Final EA also outlines program goals that would include research to more accurately assess the impacts to the population of origin by take of migrant birds.
Take of wintering eagles should not be subtracted from regional take thresholds.	Until much better data on eagle (particularly golden eagle) movements and survival are available, we see no logical alternative to this process (Also, see previous response).
For bald eagles, the regions should be those used in the PDMP, based on eagle population centers and their status, rather than arbitrary USFWS Regional boundaries. Also, the levels of potential take given on pages 103-104 do not relate to the defined population centers (CFC).	We disagree. All other migratory bird permits are issued by Region. We considered other population boundaries, but basing permitting on those boundaries would make the process confusing for permit applicants and more difficult for our Regional migratory bird permits offices. Furthermore, the PDMP doesn't cover all of the U.S.

Comment	Response
More explanation is needed as to why take thresholds are much higher than current take levels.	With the exception of the Sonoran Desert bald eagle population, neither species is listed under the ESA. In the FEA, we have reduced the take thresholds, and, while greater than under the ESA for bald eagles, they are considerably lower than in the DEA. Based upon new information from an ongoing survey, we are also proposing to maintain historical levels of permits for golden eagles and not issue permits under this proposal except for emergency situations, and where the permit will benefit the species. Issuance of permits that will still allow a stable or increasing breeding population is warranted.
Because golden eagle populations are currently declining in some areas, the EA should revise its statement that permit issuance will be predicated on increasing or stable populations, and should state instead that it will be based on the *permitted take* not resulting in discernible declines.	The FEA and the rule have revised the definition of compatible with the preservation of the bald eagle or the golden eagle" to mean consistent with the goal of stable or increasing breeding populations. The current monitoring for the golden eagle does not have the precision or accuracy to detect whether the permitted take is resulting in discernible declines, nor is there currently a thorough evaluation of the magnitude and significance of the ongoing take from un-regulated sources. We designed the TRM programmatic permit expressly to reduce that kind of take, but do not have the resources to conduct monitoring that could discern the relative effect of different sources of take.

Comment	Response
The Sonoran Desert population should be evaluated as separate from those in OK and TX. It should be assessed along with southern CA, while OK and TX should be part of the southeast region. Also, the statement on page 56 that the Sonoran Desert population is not expanding is inaccurate.	The Sonoran Desert population **is** evaluated separately from other populations. In the U.S., the population is entirely in Arizona. Bald eagles in riparian areas of the Sonoran Desert of central Arizona are being considered as a possibly Distinct Population Segment under the Endangered Species Act. We have revised our statement on page 56 to reflect that the Sonoran Desert population is expanding.
The EA needs to be more specific that the Service will not issue any permits to take bald eagles in Arizona.	Under the preferred alternative, we would not issue individual permits for take from the Sonoran Desert population. The Draft and Final EA make it clear that this population is not large enough to allow such take, regardless of its status under the ESA. However, development of programmatic disturbance permits for ongoing activities that would have measures providing long-term benefits to the eagle population will be feasible. In addition, Ecological Services may issue permits if the bald eagle remains listed in Arizona

Comment	Response
The Service needs to identify those areas where take requests may exceed thresholds and identify the process it will use to handle the situation (particularly in light of the inconsistencies between management at the scale of population centers and BCRs with Service Regional boundaries). The allocation process should be laid out in the final EA or rule.	While we cannot predict with absolute certainty those areas where take requests may exceed thresholds, we expect it will be in those areas where the take thresholds under the proposal are only incrementally above historical take levels from existing permit types. We have identified additional allocation priorities in the FEA. However, because every Region has different management needs and approaches, more specific processes, if needed, will be developed at the Regional level. In addition, it is important to remember that the permits in this FEA and rule are not to be sought in lieu of incorporating appropriate avoidance and minimization measures into project planning. They are to be sought, for individual permits, after all practicable (capable of being done after taking into consideration, relative to the magnitude of the impacts to eagles, (1) the cost of a remedy comparative with proponent resources; (2) existing technology; and (3) logistics in light of overall project purposes) avoidance and minimization measures are incorporated, and take is still likely.
The Service should develop a national allocation process that includes prioritization of significant infrastructure and public works projects, such as highways.	We believe the prioritization provisions in the regulation for projects to promote and maintain public health and safety will largely meet the concerns expressed by the commenter. In addition, if the number of applicants for permits reaches a level the Region considers high enough to make a formal allocation process necessary, each Service Region may do so.
The process by which Service Regions allocate permits must be developed through consultations with stakeholders.	Each Service Region will work with stakeholders on permit allocation if the Region deems it necessary.

Comment	Response
The DEA statement "tracking the proportion of immature breeders drawn from the floating population can be used as an early warning sign of population decline" is erroneous for 3 reasons: 1) not enough tracking of immature breeders, and 2) floater population can go down in very healthy populations because of rapid population expansion, and (3) the population may already be in dramatic decline when immature breeders are detected. Adult turnover is a more reliable indicator.	We have revised the wording the DEA on this point. However, the underlying statement is correct. Changes in the floater to breeder ratio, if they can be assessed, are a good early indicator of changes in the population. We agree that changes in adult turnover also would be excellent indicators of population stability. They are, however, also difficult to assess on a large scale. In addition, the language in question was in the discussion of the biology of raptors in Chapter 3, the "Affected Environment", and was not in the section of the document that outlined the proposed actions and how we intend to manage the program Chapter 2, "Alternatives".
The data relied upon in the DEA are questionable (e.g., Audubon knows of five nests taken in Region 4 during the period in which the DEA, Table 2 (pg. 55) says there were none.)	We agree with the comment. However, the data in question apply to take of bald eagle nests authorized under the ESA, for which we do not have detailed information. We have revised the table accordingly.
It is unclear how mortality will be factored into the take thresholds and under what circumstances TRM will be triggered (pg. 25).	For the models in the EA, we assumed worst case in every circumstance. Issuance of a nest site "disturb" permit, for example, would result in a complete loss of production from that nest for the year. Thus, the permits all account for mortality or loss of production. To specifically respond to the question of a "trigger" for TRM, it would occur when we determine that mortality is likely to occur, even with implementation of all achievable avoidance and minimization measures.

Comment	Response
The permanent loss of a nest site in FL could have larger impacts than is indicated in Table C.3 because of limited unoccupied nesting habitat. Also, the EA doesn't factor in the quality of the territory. FL is doing a study (available after September 26) comparing core nesting territories with other nesting areas (productivity, re-activation, persistence, etc.), and the study should be considered for the EA.	We agree that loss of a territory could affect a population. However, for most permits, we do not expect a nest to be lost.. We also believe the provisions of the programmatic permits and the enhanced coordination forums would meet the concerns expressed in the comment by developing protocols for adjusting thresholds based on the quality of the territory. Given the time constraints of the FEA, the results of the State-contracted study offered, when provided to us, will be incorporated into the workings and considerations of the enhanced coordination process.
The take thresholds may make it difficult or impossible in some high-activity areas for resource developers to get permits. The rule should provide that a certain portion of the available take permits be allocated for resource development projects, or exceptions should be made in some cases to make permits available above and beyond the take thresholds.	The Final Rule has included, for golden eagles, a third priority for take of inactive nests for resource recovery activity areas. Therefore, resource development his prioritized to the degree that is necessary for public health and safety, i.e., to provide a public benefit. Furthermore, the provisions for the two programmatic permits would allow activities to proceed, if the standard practices adopted as permit conditions will result in a net reduction in take or a net take of zero, and no net loss to the breeding population. Because, in each Service Region, our objective is for stable or increasing breeding populations, we will not issue more permits than we believe a population can sustain.
The number of OR bald eagles estimated in Table C.3 is too high; recent surveys indicate no more than 500 nesting pairs in OR. Also, the fledging rate has averaged 0.97 from 1971- 2006 (0.99 in 2006), whereas the DEA uses 1.3. The result is too high a take threshold for bald eagles in Oregon.	The assessment was based on the number of nests reported to the Service by the State of Oregon. The assessment is not intended to evaluate take at the State level. However, we have adjusted the vital rate values for the regional population to reflect the information provided.

Comment	Response
Most golden eagles that nest in the east migrate through a narrow bottleneck. There could be significant take including TRM of golden eagles due to siting of wind turbines along the major migration corridor. We need to be careful not to grant programmatic permits for wind development that could result in cumulative loss.	We will not issue programmatic permits for wind-power developments unless the applicants can demonstrate that there will be no net loss for the species.
New York's mapped bald eagle nests represent fewer territories than is presented in the DEA because as many as six nests may belong to a single territory. This makes the take thresholds too high; a smaller fraction should be used as the multiplier. How was the DEA number arrived at?	For nesting pairs, the permit issuance will be for activities around nests, not around territories. Should a proposed activity affect more than one nest, or result in abandonment of a territory, permitting for the activity will need to be carefully considered. If a permit for disturbance resulting in territory abandonment is issued, the allocation for that take would be higher, and may be incurred for several subsequent years, until there is data showing the local area breeding population is at the same level as it was at the time the permit was issued.
The juvenile survival rate for bald eagles of 0.77 used in the DEA is too high. (Various studies are cited.) Instead of using Florida's rate, why not use Millsap's model and use the midpoints of ranges reported in the Birds of North America accounts for annual juvenile survival?	The Millsap and Allen (2006) paper attempted to assess take for species for which there was little published information. However, we believe that, especially for bald eagles, the survival values used in the model are representative – especially given the expansion of the population in the U.S.

Comment	Response
Productivity in NY has never been as high as the 1.45 figure used in the DEA for the mid-Atlantic states. Historically, it’s been much lower, and even in the past decade averaged only 1.28.	In the DEA we used data provided by our Ecological Services offices. The difference in productivity cited for New York makes little difference in the result of the modeling, but we have factored it into the final application of the model. In addition, we believe the provisions of the programmatic permits and the enhanced coordination forums would meet the concerns underlying the comment. In addition, a State or tribe can be more restrictive and allow no or less take on lands under its jurisdiction.
The DEA does not explain how the “predicted population size” used on Table C.3 was calculated.	The “predicted population size” is the result of assessing the outcome of the population model after many years of issuance of permits. As specified in the footnotes in Table C.3., predicted population size was calculated using demographic model described in Millsap and Allen (2006). Unless otherwise specified, demographic data used come from Millsap et al. (2004) from a satellite-tagged eagle study in Florida: Adult survival = 0.83, subadult survival = 0.88, juvenile survival = 0.77, and number of young fledged per occupied territory = 1.3.
The potential elimination of one quarter of the annual production (1/2 MSY), while defensible with the adopted values, appears indefensible logically. The Millsap paper uses a cap of 5%; why was that abandoned?	We are no longer using ½ MSY as our permit threshold. The preferred alternative in the Final EA (applying an initial 5% cap on take of annual productivity for bald eagles and an initial 0% cap for take of golden eagles above the historical baseline) is more conservative than Millsap and Allen (2006) proposed for falconry take.

Comment	Response
Lower permit thresholds should be established in areas with higher levels of uncertainty.	Because, at this time, there is uncertainty regarding many factors, we cannot accurately distinguish between degrees or levels of uncertainty in different locations. However, the preferred alternative in the Final EA recognizes and provides mitigation measures (structured coordination and a national golden eagle conservation and management plan) to help us better address the uncertainty in information at multiple scales. It also sets lower disturb and take permit thresholds than were proposed in the Draft EA.
The Service should use the Raptor Population Index as part of its monitoring efforts.	We agree that the index may be very helpful in assessing population trends. However, it is not applicable in making decisions about eagle permit issuance because it does not provide information with the resolution or precision required for permit issuance decisions.
The proposal will not ensure long-term preservation of eagles due to lack of meaningful monitoring, enforcement, and penalty provisions. Instead of improving enforcement the Service proposes to address ongoing, unlawful take by making it lawful, and then relying on the good faith of the permittee to comply.	We understand the concern, but disagree with the conclusion. The action will not make unlawful take legal. Through the modeling effort, we recognize that unauthorized take occurs, and therefore limit additional mortality. However, the permits for TRM will be earned, not witlessly distributed. We believe that implementation of these permits will indirectly improve the ability of the Service Law Enforcement to enforce the Eagle Act by establishing known and achievable performance standards for avoidance and minimization of take. Ongoing take will remain unlawful and subject to prosecution unless a permit is obtained authorizing that take.

Comment	Response
Alternative 3 of the DEA is the one that results in the most take; therefore it is not the environmentally-preferred alternative.	The preferred alternative is the best choice for meeting the Service's obligations to both protect eagles and work with landowners and government agencies. It also provides the most comprehensive tools for reducing unregulated take. Therefore, we believe it is the environmentally preferred alternative.
The EA should provide 1. Detailed requirements of alternate habitat and mitigation; 2. Determination of immediate threat of active nest on an airport; 3. Need for case-by-case determinations as opposed to programmatic nest permits; and 4. Active nest removal permit issuance for airports if the Regional take threshold has already been exceeded.	The details requested by the commenter lie more appropriately within the implementation guidance, for which we will request input, review, and comment. Regarding the last item, although more specifics will be developed, if the nest removal is determined to be an emergency, safety-related take without which eagles would also be harmed, the take may not need to come off the allocation threshold.
The WEST survey yields flawed estimates of golden eagle population size because eagle detectability is not measured and corrected for in the final product.	The criticism is incorrect. The WEST survey actually employs two approaches to account for detectability bias. First, the survey uses standard line-transect sampling methods to correct for both availability and perception biases in eagle detectability. Second, because there are some situations in which line-transect sampling methods are flawed, the WEST survey also employs a double-counting, or mark-recapture, sampling element. This sampling method provides a measure of the proportion of eagles missed in the survey by having two independent observers conduct counts on one side of the aircraft simultaneously. The two detectability estimation procedures are merged in the final WEST analysis by employing a mark-recapture distance analysis approach. The result is a highly robust estimate of population size (and confidence limits) that accounts for detectability bias in the survey.

Comment	Response
The Service has inappropriately used trend data in our population model to calculate golden eagle take thresholds.	The comment is inaccurate. The Service uses data from the WEST survey in its golden eagle demographic models. While it is true that an objective of that survey is, over a number of years, to estimate golden eagle population trends, the survey is designed to yield annual population size estimates and confidence limits for golden eagles for each sampled BCR. It is these population size estimates and associated age ratios that are incorporated into the Service's demographic models, not the trend data. Further, the Service uses the demographic model-generated estimate of lambda as our gauge of the trend, and thus ability to support take, of golden eagle populations, not the observed trend from the WEST survey.

DIVISION OF MIGRATORY BIRD MANAGEMENT

Calico Solar – 08-AFC-13
DECLARATION OF SERVICE

I, Bonnie Heeley, declare that on July 30, 2010, I served and filed copies of the attached CURE EXHIBITS 400-436, REVISED SEQUENTIAL EXHIBIT LIST, AND REVISED TOPIC EXHIBIT LIST. The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at www.energy.ca.gov/sitingcases/calicosolar/CalicoSolar_POS.pdf. The document has been sent to both the other parties in this proceeding as shown on the Proof of Service list and to the Commission's Docket Unit by depositing in the U.S. mail at South San Francisco, CA, with first-class postage thereon fully prepaid and addressed as provided on the Proof of Service list.

AND

By sending an original paper copy mailed to:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 08-AFC-13
1516 Ninth Street, MS 4
Sacramento, CA 95814-5512
docket@energy.state.us.ca.

I declare under penalty of perjury that the foregoing is true and correct. Executed at South San Francisco, CA, on July 30, 2010

__________/s/_________________
Bonnie Heeley

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 08AFC13
1516 Ninth Street, MS-4
Sacramento, CA 95184
docket@energy.state.ca.us

Felicia Bellows
Vice President, Development
Tessera Solar
4800 North Scottsdale Road
Suite 5500
Scottsdale, AZ 85251
Felicia.bellows@tesserasolar.com

Gloria D. Smith, Sr. Atty.
Sierra Club
85 Second Street, 2nd Flr.
San Francisco, CA 94105
Gloria.smith@sierraclub.org

Angela Leiba
AFC Project Manager
URS Corporation
1615 Murray Canyon Rd., #1000
San Diego, CA 92108
Angela_Leiba@URSCorp.com

Allan J. Thompson
Attorney at Law
21 C Orinda Way #314
Orinda, CA 94563
allanori@comcast.net

Jim Stobaugh
BLM-Nevada State Office
PO Box 12000
Reno, NV 89520
Jim_stobaugh@blm.gov

Rich Rotte, Project Mgr.
Bureau of Land Management
Barstow Field Office
2601 Barstow Road
Barstow, CA 92311
Richard_Rotte@blm.gov

Anthony Eggert
Commissioner & Presiding Member
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814
aeggert@energy.state.ca.us

Jeffrey D. Byron
Commissioner & Associate Member
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814
jbyron@energy.state.ca.us

Paul Kramer
Hearing Officer
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814
pkramer@energy.state.ca.us

Caryn Holmes
Staff Counsel
California Energy Commission
1516 Ninth Street MS-14
Sacramento, CA 95814
cholmes@energy.state.ca.us

Christopher Meyer
Project Manager
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814
cmeyer@energy.state.ca.us

Ella Foley Gannon, Partner
Bingham McCutchen, LLP
Three Embarcadero Center
San Francisco, CA 94111
Ella.gannon@bingham.com

Loulena Miles
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Suite 1000
South San Francisco, CA 94080
lmiles@adamsbroadwell.com

Becky Jones
California Department of Fish & Game
36431 41st Street East
Palmdale, CA 93552
dfgpalm@adelphia.net

Basin & Range Watch
Laura Cunningham
Kevin Emmerich
PO Box 70
Beatty, NV 89003
atmoictoadranch@netzero.net

Patrick C. Jackson
600 n. Darwood Avenue
San Dimas, CA 91773
ochsjack@earthlink.net

California ISO
e-recipient@caiso.com

Defenders of Wildlife
Joshua Basofin
1303 J Street, Suite 270
Sacramento, CA 95814
jbasonfin@defenders.org

Kristy Chew, Adviser to
Commissioner Byron
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814
kchew@energy.state.ca.us

Society for the Conservation of
Bighorn Sheep
Bob Burke & Gary Thomas
PO Box 1407
Yermo, CA 92398
Cameracoordinator@
sheepsociety.com

Steve Adams, Co-Staff Counsel
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814
sadams@energy.state.ca.us

Jennifer Jennings
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814
publicadviser@energy.state.ca.us

County of San Bernardino
Ruth E. Stringer, Co. Counsel
Bart W. Brizzee, Dpty. Co.Co.
385 N. Arrowhead Ave., 4th Flr.
San Bernardino, CA 92415-0140
bbrizzee@cc.sbcounty.gov

Newberry Community Service District
Wayne W. Weierbach
PO box 206
Newberry Springs, CA 92365
newberryCSD@gmail.com

Lorraine White, Adviser to
Commissioner Eggert
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814
lwhite@energy.state.ca.us